Cancer in the Northwest Territories

1990-2000

A Descriptive Report

December 2003

Northwest Territories Health and Social Services

Executive Summary

Cancer in the Northwest Territories (1990-2000) provides a descriptive profile of cancer in the Northwest Territories (NWT). Its first objective is to examine cancer incidence (1992-2000) and mortality (1990-1999) within the NWT population and compare rates to Canada (1996). The secondary goal of this report is to describe the various approaches for controlling cancer in the NWT.

This report is organized into three sections:

Part 1: Profile of Cancer in the NWT

This section examines cancer incidence and mortality in relation to gender, cancer sites, ethnic groups, and community types. Cancer burden and survival in the NWT are also briefly discussed. The sources of data used for this section are derived from the NWT Cancer Registry and the NWT Vital Statistics Registry. Canadian cancer rates are based on data released from Health Canada's Cancer Bureau.

Part 2: Cancer Control

This segment of the report looks at the different types of interventions (e.g. prevention, early detection, treatment, and cancer support/rehabilitation) that are currently undertaken to minimize the impact of cancer in the NWT. Using data from the *Canadian Community Health Survey (2000-2001)*, risk factors for cancer and health behaviours practiced in the NWT are examined and compared to Canada. This chapter also reveals some of the challenges with delivering cancer care in the NWT.

Part 3: Developing an NWT Action Plan for Cancer Control

This final chapter provides some insights to assist the development of an action plan on cancer control in the NWT. The benefits and disadvantages of a cancer-specific vs. a chronic disease strategy are briefly outlined. The importance of multiple stakeholder involvement is outlined and suggestions are made as to how components of cancer control would fit into the Integrated Service Delivery Model.

Key Findings

Cancer is a disease feared by most individuals. According to the *Canadian Strategy for Cancer Control*, one in three persons will develop cancer during their lifetime and half of these will become long-term survivors. It is therefore likely that most Canadians will know someone affected by cancer. The projected cancer burden due to the aging population will also present an extraordinary challenge to the healthcare system in the near future. This report brings to the light some interesting and some not-so-surprising features about cancer in the NWT. Below is a list of key findings presented throughout the report.

Profile of Cancer in the NWT

NWT

- During 1992-2000, an average of 75 new cases of cancer occurred each year in the NWT.
- Between 1990 and 1999, an annual average of 34 cancer deaths took place in the NWT.
- The most frequent cancer diagnosis is colorectal cancer in males (22% of all diagnoses) and breast cancer in females (28% of all diagnoses).
- Lung cancer is the leading cause of cancer deaths (32%).

In Canada, the male cancer incidence and mortality rates are typically higher than the female rates. In the NWT, the crude incidence and mortality rates between males and females are similar. However, the female incidence rate in certain age groups (i.e. 40 to 49 and 50 to 59 years old) is higher than the male rate. In addition to these findings:

Males

- The age-adjusted incidence rate for all cancer diagnoses is 15% lower in NWT males compared to males in Canada.
- Although prostate cancer is the third most prevalent diagnosis in males, the age-adjusted rate for prostate cancer is more than 50% lower than the Canadian rate. Meanwhile, colorectal and stomach cancer rates are almost 50% and 100% higher than corresponding rates in Canadian males.
- Males from the Non-Aboriginal/Métis and the Dene ethnic groups are 15% and almost 20% less likely to have cancer than males in Canada. Inuit males have rates similar to Canadian males.
- Age-adjusted cancer incidence rates among NWT males living in smaller communities and regional centres are almost 20% and 25% lower than the male rate in Canada. Males living in Yellowknife have rates similar to Canadian males.
- The age-adjusted cancer mortality rate in NWT males is similar to Canadian males.

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- The cancer mortality rate in Non-Aboriginal/Métis is 20% lower, whereas the male Inuit have cancer mortality rates that are 50% higher than the male Canadian rate. Dene males have rates similar to Canadian males.

Females

- The age-adjusted cancer incidence rate in NWT females is similar to Canadian females.
- The age-adjusted cancer mortality rate among NWT females is almost 20% higher than the rate among Canadian females.
- The incidence and mortality rates for lung and colorectal cancer in NWT females are significantly higher than the rates in Canadian females.
- Although breast cancer is the most frequent diagnosis in NWT women, the age-adjusted incidence and mortality rates are similar to the national rates.
- The cancer mortality rate among female Inuit is almost 70% higher than rates in Canadian females. The rates for Dene and for Non-Aboriginal/Métis females are similar to Canadian females.
- Women living in regional centres have a cancer incidence that is more than 40% higher and a mortality rate that is 45% higher than Canadian females.

Cancer Control

Cancer control aims to prevent cancer, cure cancer, or increase survival and quality of life for those who develop cancer, by converting the knowledge gained through research, surveillance and outcome evaluation into strategies and actions. (*Canadian Strategy for Cancer Control*)

Prevention

The report reviews some of the various causes of cancer. Although the avoidance of prolonged exposure to ultraviolet radiation, the strict control of occupational carcinogens, the cautious use of certain prescription drugs and medical procedures, and the development of sound environmental policies can all contribute to the prevention of cancer, these have an overall smaller impact compared to quitting smoking, improvements in diet, reduced obesity, and greater physical activity.

Smoking: Smoking is responsible for 30% of all cancer deaths.

- Smoking rates in the NWT are nearly twice the national rate. According to the *Canadian Community Health Survey (2000-2001)*, an estimated 46% of NWT residents 12 years of age and older smoked in 2000-2001 in comparison to 26% in Canada as a whole.
- 51% of individuals who live in smaller communities are more likely to smoke, compared to 42% living in larger regional centres.
- An estimated 40% of non-smokers in the NWT indicate exposure to second-hand smoke on most days, compared to 28% of Canadians.

Nutrition and obesity: The consumption of between five to ten servings of fruits and vegetables per day can decrease the risk of cancer by 20%. Poor nutrition and obesity in adults are risk factors linked to 30% of cancer deaths.

- According to the *Canadian Community Health Survey (2000-2001)*, only 26% of NWT residents (12 years and older) consume the Canadian Food Guide's recommendation of five to ten servings of fruits and vegetables a day (19% males, 33% females), compared to 37% of the Canadian population.
- More than half (57%) of the population in the NWT (aged 20 to 64 years, excluding pregnant females) is overweight or obese (62% males, 52% females). In Canada, 48% of the similar population is overweight or obese (56% males, 40% females).

Physical activity: A sedentary lifestyle may account for 5% of all cancer deaths.

- Fifty-five percent of NWT residents (12 years and older) are inactive. This is consistent with the national average of 53%.

Early Detection

Early detection through cancer screening is another strategy to reduce cancer mortality.

- Mammography for women aged 50 to 69 years every two years can decrease cancer mortality by up to 25%. Based on data from the Canadian Community Health Survey (2000-2001), only 54% of NWT women aged 50 to 69 years had a mammogram within the last two years, compared to 70% of eligible Canadian women.
- Since the introduction of the Pap test in Canada (1969), the national cervical cancer age-standardized mortality rate decreased by almost 70% in 1997. In 2000-2001, 79% of NWT women aged 18 and older had received a Pap smear within the last three years in comparison to 71% of Canadian women.
- Colorectal cancer screening can decrease colorectal cancer mortality by 15 to 33% in a targeted population of 50 to 74 year olds. Currently there is no official program or guideline for colorectal cancer screening in the NWT. However, the relatively high number of cancer diagnoses and deaths from colorectal cancer in the territories suggests that a colorectal cancer screening program may warrant consideration and could prove beneficial for NWT residents.

Cancer Treatment

Treatment can include surgery, radiation therapy, chemotherapy, immunotherapy or hormone therapy. Sometimes a treatment plan will involve a combination of these therapies. It can also include alternative or traditional healing practices. However, consultation with the treating physician is encouraged to determine compatibility with medical treatment. Certain treatments are provided at the Stanton Territorial Hospital in Yellowknife, while others are only offered by more specialized facilities outside of the NWT. The majority of NWT patients are referred to the Cross Cancer Institute in Edmonton, Alberta. However, the location of treatment is decided on a case-by-case basis (taking into consideration space, equipment, staff capacity, skill level, and what is deemed best for the patient).

Continuing Care/Supportive Services

The needs of the patient – physical, social, emotional, nutritional, informational, psychological, spiritual, and practical – must be addressed throughout all stages of the patient's care. Treatment extends beyond the hospital and includes care provided in the community or at home. In order to do so, a coordinated approach is needed to provide access to a full range of services in all communities and ensure seamless delivery between the community and hospital.

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Scope of the Report

Cancer in the Northwest Territories (1990-2000) profiles cancer in the Northwest Territories (NWT) over the period from 1990 to 2000. The primary goal of the report is to describe cancer incidence[a] (1992-2000) and cancer mortality (1990-1999) within the NWT population and compare the rates to Canada (1996). For both incidence and mortality, this report conveys the most up to date information available at the time of writing.

Since the annual number of cancer cases and deaths is relatively small, for statistical purposes, the cancer data was aggregated over several years. The information provided in this report represents nine years of data for cancer incidence (1992-2000) and ten years of data for mortality (1990-1999). Even though combining several years of data can mask recent trends, the aggregation of years is necessary to achieve greater rate stability.

The data is presented according to gender, ethnicity and community type. The most prevalent cancers are identified for each group and compared to gender-specific national rates.

Ethnicity is categorized into the following three groups: Dene, Inuit and Non-Aboriginal/Métis. The number of people self-reporting ethnicity as Métis at time of healthcare plan registration is significantly lower than population estimates indicate. Therefore, the data for Non-Aboriginal persons and Métis were combined. To do otherwise would have created a risk of producing inaccurate analyses.

Community type refers to the place of permanent residence at the time of diagnosis or death and includes the following groupings: Yellowknife, "Regional Centres" (includes Hay River, Fort Smith and Inuvik), and "Smaller Communities" (the remaining communities in the NWT).

This report provides information on cancer patterns in the territory based on data from the NWT Cancer Registry (1992-2000) and NWT Vital Statistics Registry (1990-1999). Canadian rates are based on data released from Health Canada – Cancer Bureau. The Department of Health and Social Services administers the NWT Cancer Registry. Under authority from the *NWT Disease Registries Act*, the Cancer Registry records all newly diagnosed cases of invasive cancer, as well as selected benign tumours and carcinoma in situ.[b] The Cancer Registry is a population-based cancer registry that collects information on cancers diagnosed in all NWT residents. The main purpose of the Registry is for cancer surveillance. Cancer surveillance is the collection, review and analysis of cancer data so as to describe incidence, prevalence, morbidity, and

The Canadian Cancer Registry is a dynamic national database which collects data from every provincial/territorial cancer registry in Canada. It succeeded the National Cancer Incidence and Report System (1969-1991) and commenced with the recording of all cancer cases first diagnosed in 1992.

National Cancer Institute of Canada

[a] Cancer incidence signifies the number of cancer cases diagnosed within a specified period. This differs from cancer prevalence, which indicates the number of people that have cancer at a given point in time.

[b] Invasive cancers are malignant tumours that tend to invade and destroy nearby tissue and spread to other parts of the body. Benign tumours do not invade nearby tissue or spread to other parts of the body. In situ cancers are confined to the point of origin and have not spread.

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Ethnicity is categorized into the following three groups: Dene, Inuit and Non-Aboriginal/Metis. The number of people self-reporting ethnicity as Metis at time of healthcare plan registration is significantly lower than population estimates indicate. Therefore, the data for Non-Aboriginal persons and Metis were combined. To do otherwise would have created a risk of producing inaccurate analyses.

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mortality due to cancer in the population. The Cancer Registry does not collect information on treatment or prognosis of individuals diagnosed with cancer. Thus, the primary emphasis of the registry is on public health and epidemiology.

Data for the analysis of cancer incidence is derived from the NWT Cancer Registry. The Cancer Registry only includes cancer cases diagnosed among permanent residents of the NWT. Thus, NWT people who resided elsewhere at the time of diagnosis are not included in the cancer incidence analyses.

Data for the analysis of cancer mortality was derived from the NWT Vital Statistics Registry. The cancer mortality analyses include all individuals who died of cancer and were permanent NWT residents at the time of death. This is regardless of whether they were residing out of territory at the time of diagnosis or if they died in an out of province hospital or long-term care facility. A NWT resident who dies of cancer, but who was diagnosed elsewhere while living outside of the NWT, is not recorded in the NWT Cancer Registry but is captured in the NWT Vital Statistics Registry.

In the report, a cancer "case" represents a malignant cancer, while a cancer "site" is the site of tumour origin. The analyses do not include benign tumours and carcinoma in situ. In addition, secondary tumours, which result from the spreading of cancer to other organs, are not considered as new "cases". However, it is possible for a person to have more than one malignant cancer (i.e. cancers unrelated to each other). In this instance, each cancer is registered and counted as a separate "case".

In general, NWT rates for all cancer sites were significantly lower than Canadian rates in 1996. This is because the population of the NWT is relatively young in comparison to Canadians overall. As the NWT population continues to age, the disease will become more prevalent and an increasing burden to society and the healthcare system.

The second part of this report examines the various interventions for cancer control. Cancer control aims to prevent cancer, cure cancer, and increase survival and quality of life for those who develop cancer, by converting the knowledge gained through research, surveillance and outcome evaluation into strategies and actions.[1] The report describes the various risk factors for cancer and ways of reducing risks. NWT residents and Canadians are compared in regards to risk factors and protective behaviours. The data measuring health or risk behaviours is derived from the *Canadian Community Health Survey (CCHS) 2000-2001*. Unless otherwise stated, these statistics are limited to individuals who are 12 years or older.

Cancer screening, which allows for early detection and thus early treatment, is another strategy to reduce cancer mortality. Currently, screening programs for breast and cervical cancer exist in the NWT. Using the CCHS, rates for breast and cervical cancer screening in the NWT were compared to Canadian values. There is, presently, no guideline for colorectal cancer screening. However, the relatively high number of cancer diagnoses and deaths from colorectal cancer in the territory suggests that a colorectal cancer-screening program may warrant consideration and could prove beneficial for NWT residents.

Cancer treatment is primarily provided at Stanton Territorial Hospital or in Edmonton, Alberta. This report briefly reviews the various modes of cancer treatment that exist. It also outlines the various supports that are available for persons living with cancer in the NWT, since quality of life is also an important component in cancer control.

The final chapter provides some insights towards the development of an action plan for cancer control in the NWT. The benefits and disadvantages of a cancer-specific versus a chronic disease strategy are briefly conveyed. The importance of multiple stakeholder involvement is outlined and suggestions made as to how different components of cancer control would fit into the Integrated Service Delivery Model.

The appendices include comprehensive sex-specific tables of cancer incidence and mortality rates for NWT as a whole and for each ethnic group and community type. The tables present data for each cancer site meeting the criteria for analysis. Data include the number of cases (deaths), crude rates, age-adjusted rates, standardized incidence (mortality) ratios, and associated 95% confidence limits.

Confidentiality

The Northwest Territories law requires safeguarding the confidentiality of persons whose cancers are reported to the Registry. The authors of this report have given this matter highest consideration. Data in this report is therefore presented in such a way to prevent the identification of individuals with cancer. As a result, any analyses with five or fewer cases have been suppressed from presentation.

The Canadian Coalition on Cancer Surveillance's vision is to develop a high-quality population-based surveillance system for evaluating health determinants, management programs and the outcomes of cancer. The Coalition will provide crucial information for developing policies and strategies to reduce the burden of cancer in Canada.

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Cautions on Interpretation

The validity of rates depends on the completeness of cancer reporting and on the accuracy of population estimates. Incidence data in this report are based on cases of primary cancer that were diagnosed and reported to the Registry between January 1, 1992 and December 31, 2001. Any additional cancer cases that are reported to the Registry for this time period will be included in future reports. Population estimates are also subject to periodic revisions. For these reasons, rates in this report may not necessarily correspond with other information covering this time period.

Many of the rates are based on small numbers and, therefore, have a large degree of associated variability. In particular, the number of cases (deaths) will drop sharply as the data is further categorized by gender and ethnicity or community type. This will result in even further imprecise rates for the smallest groups. *When examining the rates, the reader is cautioned to take into account the number of cases on which these are based.*

Because the indirect method of age-adjustment is used, NWT group-specific rates (i.e. specific for gender and ethnicity or community type) cannot be compared to one another. This is because the 'weights' used to age-adjust ethnicity or community specific rates are equivalent to the relative proportion of individuals in a given age group for that particular ethnic group or community type. Thus, the age-adjusted rates for each ethnic group or community type can only be compared to the Canadian rate (the reference population), rather than to another ethnic group or community type. For example, the male Dene age-adjusted rate cannot be compared to the male Inuit rate; it can only be compared to the Canadian male rate.

Cancer in the Northwest Territories (1990-2000) is meant as an information resource that should prove useful to a wide range of individuals with an interest in understanding cancer in the North. While written mainly for healthcare providers and program planners, it will also inform policy makers, community leaders and interested members of the public about cancer in the NWT. The document is an important reference for achieving greater integration and coordination of cancer prevention, screening, treatment, and support services.

Introduction

Cancer in the Northwest Territories (1990-2000) profiles cancer within the NWT population and compares NWT rates to Canada (1996). It also examines the various approaches for managing cancer in the population. Cancer control aims to prevent cancer, cure cancer, and increase survival and quality of life for those who develop cancer, by using the knowledge gained through research, surveillance and outcome evaluation into strategies and actions.[1]

The report concludes with considerations for developing an action plan on cancer control in the NWT, including a description of the national strategy for cancer control, the pros and cons of a cancer-specific versus a chronic disease (with a cancer component) strategy, the multiple stakeholders and their existing or potential approaches to cancer control, and how aspects of cancer control would fit into an Integrated Service Delivery Model for the NWT.

What is Cancer?

Cancer is the uncontrolled growth of cells in the body. The immune system can usually recognize abnormal cells and destroy them. However, if cancer cells succeed to bypass this defence mechanism, they can multiply and form a lump or a tumour.

The tumour may be considered benign if its growth remains under some control and localized to a specific area. Such tumours are generally surgically removed. On the other hand, when abnormal cells invade the surrounding tissue and spread to other parts of the body, the tumour is labelled malignant.

While some cancer cells grow rapidly, others grow slowly. Furthermore, some cancers can be cured if diagnosed early, whereas others are more resistant to treatment and therefore more life threatening.

The occurrence of cancer is often associated with specific risk factors. Genetics can play a role: individuals who have a previous family member with the disease can be at greater risk. In this situation, the genetic risk factor cannot be altered, but more emphasis can be placed on prevention and early detection.

More commonly, cancer can result from repeated or, more rarely, a one-time large dose exposure to external substances such as cigarette smoke, ultra-violet rays from the sun, viruses or environmental agents. Obesity is also documented as an independent risk for certain types of cancer, as are certain types of foods. Whereas the above exposures increase a person's chance of getting cancer, a healthy diet and physical activity can be protective against cancer.

Cancer is not a modern disease. Hippocrates introduced the term cancer in the 4th century BC. The word is derived from the Greek word karkinoma that means crab. Hippocrates used this term because he noticed that some breast tumours had extensions like a crab's legs or claws.

dos Santos Silva I. Cancer Epidemiology: Principles and Methods. World Health Organization - international agency for research on cancer. Lyon, France, 1999

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Cancer is not a modern disease. Hippocrates introduced the term cancer in the 4th century BC. The word is derived from the Greek word karkinos that means crab. Hippocrates used this term because he noticed that some breast tumours had extensions like a crab's legs at sides.

It is important to keep in mind that exposure to risk factors does not necessarily mean a person will get the disease. Likewise, a person who practices prevention cannot guarantee the absence of disease; it only decreases the likelihood. In most cases, the specific cause of cancer in an individual is unknown, especially when exposed to several risk factors. In addition, there is often a time lag of five to 20 years before cancer even develops or can be diagnosed. This makes it especially difficult to attribute the cancer to a specific factor.

Brief History of the NWT Cancer Registry

Mandatory reporting of cancer in the NWT began in 1990. Although data on cancer in the NWT exists from the 1960s onward, prior to 1990 it was pieced together from a variety of sources, especially death certificates and information from cancer registries in provinces where NWT residents were treated for cancer.

For the purpose of national reporting, prior to 1992, NWT data was fed into the Statistics Canada administered National Cancer Incidence Reporting System, which did not link cases at a national level. Therefore, the possibility existed for patients to be registered in more than one jurisdiction. Beginning in 1992, the Canadian Cancer Registry (CCR) was implemented. The CCR is a 'person-oriented' system which, amongst other things, ensures that individuals are registered in only the jurisdiction of residence at the time of diagnosis.

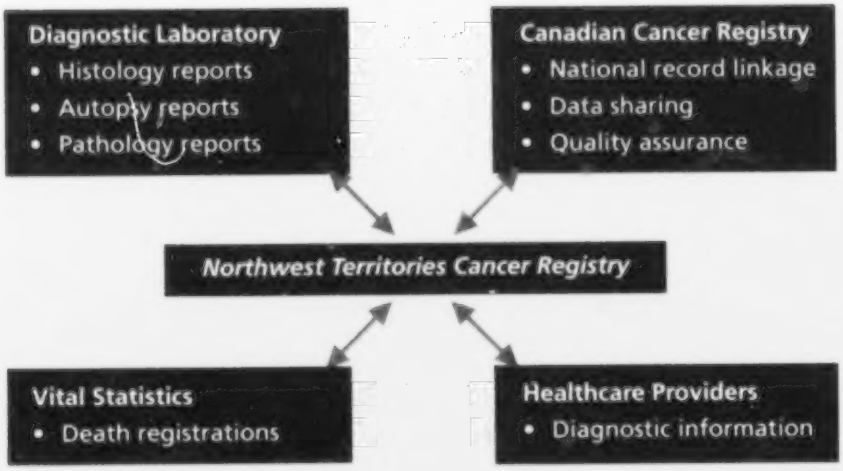
This is accomplished through record linkages at the national level and feedback from the CCR to the contributing Registries, including the NWT Registry. Registered cancers may then be deleted from the NWT Registry in instances where a tumour was first diagnosed when an individual was living in another province (i.e. before they resided in the NWT). Conversely, unreported cases of cancer in NWT residents that may have been diagnosed and registered elsewhere can be added to the Registry. The CCR system improves the ability to report accurately.

Accurate reporting of cancers is especially important in the NWT because of the small population. The cancer statistics are very sensitive to small changes in the number of cases.

Data Collection

A newly diagnosed tumour can be recorded in the NWT Cancer Registry in several ways, as illustrated in Figure 1. Notification is usually received from a diagnostic laboratory and/or the patient's primary physician. Occasionally, the Registry is notified by the CCR of a cancer diagnosed and registered elsewhere, as discussed above. The Registry staff may also be alerted to an unreported or previously undiagnosed tumour through a periodic review of death certificates. When a cancer is indicated as contributing to the death of an individual on a death certificate, the Registry staff contact healthcare providers in an attempt to verify the relevant diagnostic information.

Figure 1
Collection of Cancer Registration Data



Two important measures of data quality are the percentage of cancers microscopically confirmed and the percentage of cases confirmed by death certificate only. The NWT Cancer Registry has relatively few (2.3%) records based on either death certification alone or unknown method of diagnosis. Of incidence records included in this report, 92% were confirmed microscopically.

The pursuit of comprehensive registration using multiple sources of information presents significant challenges. Many activities are directed at addressing data accuracy, completeness and integrity.

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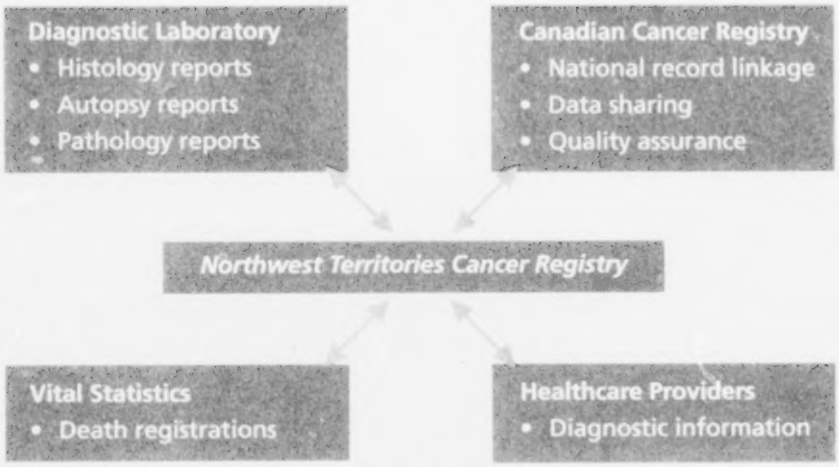

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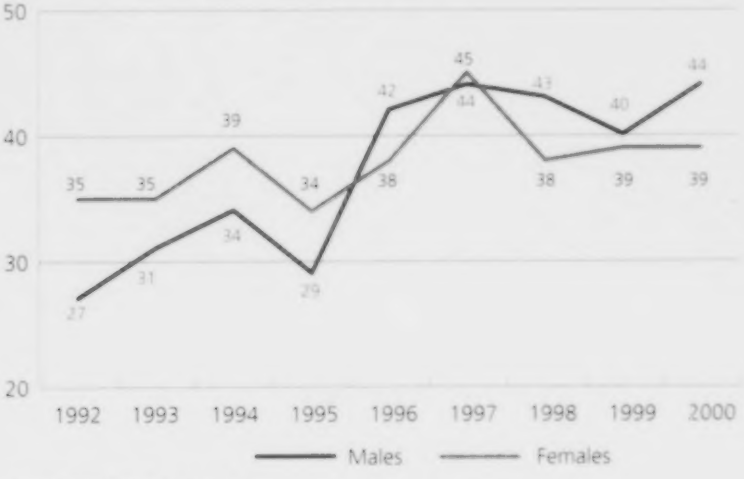
Profile of Cancer in the NWT

Cancer Incidence (1992-2000)

Incidence Trends

In the NWT, an average of 75 cases of cancer were diagnosed annually from 1992 to 2000. For men and women, the yearly numbers of cases varied, ranging from 27 to 44 cases in males and from 34 to 45 cases in females (Figure 2). Overall, there appears to be an increasing trend in the number of newly diagnosed cancers in men. However, prior to drawing any conclusions on trends, it is important to examine rates. Rates take into account the population size at risk of cancer. This is because the rise or decline in the number of cases may simply reflect an increase or decrease in the total population.

Figure 2
Number of Cancer Diagnoses (1992-2000)



Source: NWT Cancer Registry

Figure 3 presents the three-year rolling averages[4] for crude incidence rates. Based on this analysis, the crude male incident rate shows an increase of 36% (from 146 to 198 cases per 100,000 person-years) over the period of 1992-1994 to 1998-2000, whereas the female incident rate remained relatively constant. Upon adjusting for the age differences in the population between each period, however, we find that the rates have actually remained relatively stable throughout that period. This suggests that the increasing age in the population is primarily responsible for the rise in crude incidence rates.

According to the Canadian Cancer Statistics 2003, an estimated 139,900 new cases of cancer and 67,400 deaths from cancer will occur in Canada in 2003. With the exception of non-melanoma skin cancer, the most frequently diagnosed cancer will continue to be breast cancer for women and prostate cancer for men. The leading cause of cancer death for both sexes continues to be lung cancer.

Canadian Cancer Statistics 2003

[4] Rolling averages reduce the year-to-year fluctuation in the number of cases diagnosed with cancer. The three-year rolling rate is a ratio of the number of cancer incidents in a three-year period relative to the sum of the population size for each year of the specified period. By combining three years of data to create one point in the graph, the trend becomes less variable and forms a smoother curve. This analytical approach is particularly useful in assessing whether cancer rates are increasing or decreasing in very small populations like the NWT.

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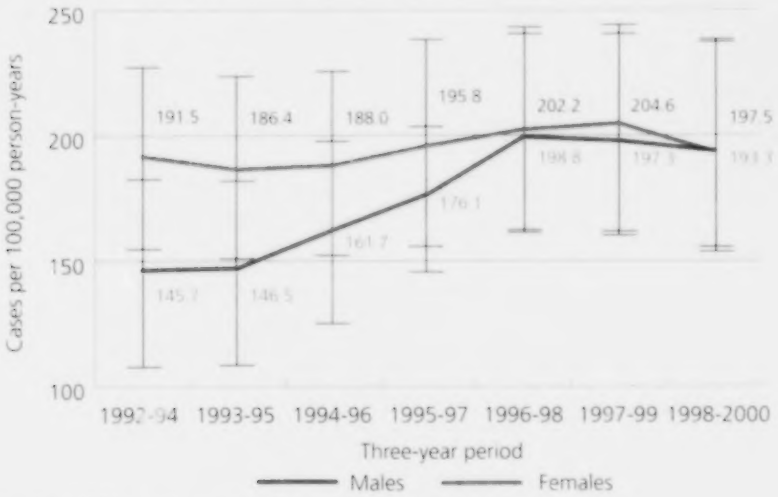
In the NWT, an average of 75 cases of cancer were diagnosed annually from 1992 to 2000. For men and women, the yearly numbers of cases varied, ranging from 27 to 44 cases in males and from 34 to 45 cases in females (Figure 2). Overall, there appears to be an increasing trend in the number of newly diagnosed cancers in men. However, prior to drawing any conclusions on trends, it is important to examine rates. Rates take into account the population size at risk of cancer. This is because the rise or decline in the number of cases may simply reflect an increase or decrease in the total population.

Figure 2

According to the Canadian Cancer Statistics 2003, an estimated 139,900 new cases of cancer and 67,400 deaths from cancer will occur in Canada in 2003. With the exception of non-melanoma skin cancer, the most frequently diagnosed cancer will continue to be breast cancer for women and prostate cancer for men. The leading cause of cancer death for both sexes continues to be lung cancer.

Nationally, cancer incidence rates are typically higher in males. Although the incidence rates for cancer diagnoses appear higher in females in comparison to males (especially in the earlier half of the decade), this difference is not statistically significant. However, it is important to note that small numbers can create unstable rates and wide confidence intervals, thus making it more difficult to detect real differences when two populations are compared.

Figure 3
Three-year Rolling Cancer Incidence Rate (1992-2000)



Sources: NWT Cancer Registry and NWT Bureau of Statistics

Distribution of Cancer Diagnoses

Tables 1 and 2 illustrate the distribution of cancer types for NWT males and females. From 1992 to 2000, the most frequent diagnoses for cancer in men are colorectal (22%), lung (19%) and prostate (11%). These cancers are similarly prevalent within the various ethnic groups and community types, with some variation in proportions and ranking (Tables 3 and 4). The only exception is stomach cancer, which is the second most prevalent cancer in Inuit males and tied for third most prevalent in Dene males.

Breast cancer is the most common cancer diagnosed in females, representing 28% of all diagnoses. This is followed by colorectal (15%) and lung cancer (14%). Similar to the males, the top three cancer diagnoses for females within the various ethnic groups and community types are the same, but with slight variations in rank (Tables 3 and 4).

Table 1
NWT Male Cancer Diagnoses (1992-2000)

Cancer Site	Total	%
All Sites	334	100
Colorectal	74	22.2
Lung	65	19.5
Prostate	38	11.4
Stomach	22	6.6
Non-Hodgkin's Lymphoma	18	5.4
Oral	14	4.2
Bladder	12	3.6
Kidney	12	3.6
Testis	11	3.3
Other	68	20.3

Source: NWT Cancer Registry

Table 2
NWT Female Cancer Diagnoses (1992-2000)

Cancer Site	Total	%
All Sites	342	100
Breast	96	28.1
Colorectal	53	15.5
Lung	49	14.3
Pancreas	15	4.4
Ovary	15	4.4
Oral	13	3.8
Malignant Melanoma	13	3.8
Cervix	13	3.8
Kidney	12	3.5
Liver and Gallbladder	11	3.2
Other	52	15.2

Source: NWT Cancer Registry

Table 3a
Top Three Cancer Diagnoses in Males by Ethnic Group

		Male		
		Dene (n=109)	Inuit (n=32)	Other (n=193)
Rank	1	Colorectal (35%)	Trachea, Bronchus and Lung (25%)	Trachea, Bronchus and Lung (19%)
	2	Trachea, Bronchus and Lung (19%)	Stomach (16%)	Colorectal (17%)
	3	Prostate (7%) Stomach (7%)	x	Prostate (14%)

'Other' includes Non-Aboriginals and Metis. X = cells with less than five cases are suppressed. N values represent the number and % values represent the proportion of cases in each gender-specific ethnic group.
Source: NWT Cancer Registry (1992-2000)

Table 3b
Top Three Cancer Diagnoses in Females by Ethnic Group

		Female		
		Dene (n=102)	Inuit (n=36)	Other (n=204)
Rank	1	Breast (24%)	Breast (22%) Colorectal (22%)	Breast (31%)
	2	Colorectal (22%)		Trachea, Bronchus and Lung (13%)
	3	Trachea, Bronchus and Lung (16%)	Trachea, Bronchus and Lung (19%)	Colorectal (11%)

"Other" includes Non-Aboriginals and Metis. X = cells with less than five cases suppressed. N values represent the number and % values represent the proportion of cases in each gender-specific ethnic group.
Source: NWT Cancer Registry (1992-2000)

Table 4a
Top Three Cancer Diagnoses in Males by Community Type

		Male		
		Yellowknife (n=120)	Regional Centres (n=81)	Smaller Communities (n=133)
Rank	1	Trachea, Bronchus and Lung (19%)	Colorectal (20%)	Colorectal (30%)
	2	Colorectal (16%)	Trachea, Bronchus and Lung (16%)	Trachea, Bronchus and Lung (22%)
	3	Prostate (13%)	Prostate (12%)	Prostate (9%)

Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT. N values represent the number and % values represent the proportion of cases in each gender-specific community type.
Source: NWT Cancer Registry (1992-2000)

Table 4b
Top Three Cancer Diagnoses in Females by Community Type

		Female		
		Yellowknife (n=117)	Regional Centres (n=120)	Smaller Communities (n=105)
Rank	1	Breast (32%)	Breast (30%)	Trachea, Bronchus and Lung (23%)
	2	Colorectal (12%)	Colorectal (15%)	Breast (22%)
	3	Trachea, Bronchus and Lung (11%)	Trachea, Bronchus, and Lung (10%)	Colorectal (20%)

Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT. N values represent the number and % values represent the proportion of cases in each gender-specific community type.
Source: NWT Cancer Registry (1992-2000)

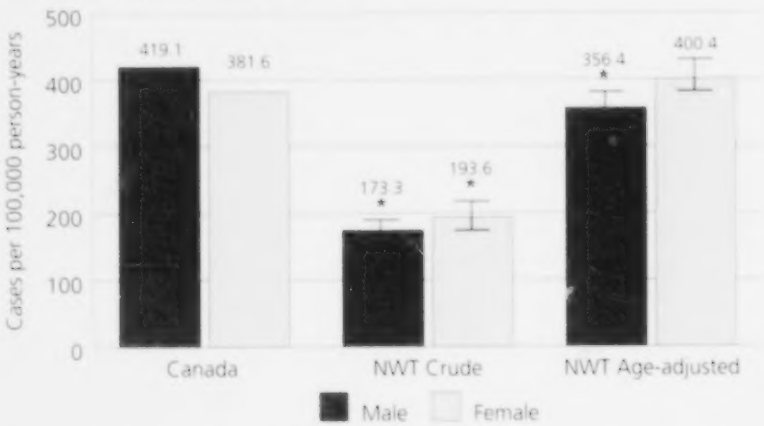
Comparison of NWT Cancer Incidence Rates to National Rates

Crude rates are important for measuring the actual burden placed on the healthcare system. However, it is inappropriate to use them when comparing rates from one region to another. For example, the NWT has a relatively younger population than Canada as a whole. Since cancer tends to affect older people, it is not surprising that the male and female crude incidence rates in the NWT are less or equal to half the rates in Canada (Figure 4).

To account for age differences between two populations, the rates are often adjusted. Although age-adjusted rates are not "real" (i.e. they do not represent the actual burden of cancer in the population), they provide insight into the relative risk of developing cancer between NWT and Canadian populations. If crude rates alone are examined, one might conclude from NWT's low crude rates that living in the NWT conveys some protection against cancer. The age-adjusted rates indicate otherwise; the low NWT crude cancer rates are actually the result of a population that is younger than the rest of Canada.

Once the differences in age distribution between the NWT and the Canadian population are taken into account,[4] males in the NWT are 15% less likely to have cancer than their Canadian counterparts, while NWT women had the same overall cancer rates as their Canadian counterparts (Figure 4).

Figure 4
NWT and Canada Cancer Incidence Rates
(Crude vs. Age-adjusted Statistics)



Rate is significantly lower * (p value <0.05) than Canada's sex-specific rate
Sources: NWT Cancer Registry (1992-2000) and Health Canada - Cancer Bureau (1996)

Based on data examined by the working group on cancer of the International Union for Circumpolar Health, the circumpolar Inuit have among the world's highest rates of cancers which are very rare in most other populations: nasopharyngeal, salivary gland and esophageal cancer. The term "Eskimoma" has even been coined for the type of salivary gland tumour commonly observed among the Inuit.

Hildes JA, Schaefer O. The changing picture of neoplastic disease in the western and central Canadian Arctic (1950-1980). Canadian Medical Association Journal 1984; 130:25-33

[4] Rates are adjusted for age using the indirect method for standardization and the 1996 Canadian population as the standard population. Tests for statistical significance and confidence intervals were calculated assuming the Poisson distribution. Significance level was defined by a p value of less than 0.05.

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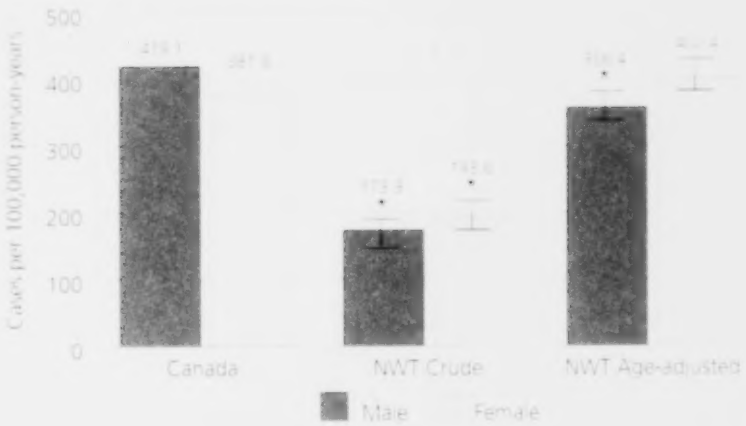

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Hilden JA, Schaefer O. The changing pictures of neoplastic disease in the western and central Canadian Arctic (1950-1980). Canadian Medical Association Journal 1984; 130:25-33.

Table 5 summarizes by gender the cancer sites in which NWT has significantly lower or higher age-adjusted incidence rates compared to Canada as a whole. The standardized incidence ratio (SIR) is the number of events observed versus the number of events expected when the rates are adjusted for age. If the number of observed events is equal to the number expected, the SIR is equal to 1.00. If the SIR is greater than 1.00, then the number of observed events is greater than the number expected, and an SIR less than 1.00 indicates the opposite. Multiplying the SIR with the Canadian rate provides the age-adjusted rate for the NWT.

It is important to consider the confidence intervals when examining the SIR. A confidence interval is the range within which the "true" value (in this the case, the ratio) is expected to fall 19 out of 20 times. If the confidence interval overlaps the value of 1.0, then the NWT rate cannot be said to differ from the Canadian rate.

As the number of cancer cases becomes smaller, the confidence interval widens and the calculated rate or ratio becomes less stable or accurate. For example, the SIR for liver/gallbladder in females is 3.3. Based on the confidence intervals, the true value for the SIR can lie anywhere between 1.7 and 6.0. Such a wide confidence interval makes the SIR of 3.3 a very imprecise estimate. As a consequence, the incident rate for liver/gallbladder cancer in NWT females can range from almost 1.7 to as much as 6.0 times the rate in Canadian females.

Table 5
Cancers in the NWT with Age-adjusted Incidence Rates Lower or Higher than Canada

Gender	Cancer Site	Number of Cases (1992-2000)	Standardized Incidence Ratio (SIR) with Confidence Intervals
Males	Colorectal**	74	1.47 (1.16, 1.85)
	Prostate*	38	0.49 (0.35, 0.67)
	Stomach**	22	1.94 (1.22, 2.94)
Females	Colorectal**	53	1.69 (1.27, 2.21)
	Lung**	49	1.44 (1.07, 1.91)
	Pancreas**	15	2.45 (1.37, 4.04)
	Oral**	13	2.60 (1.38, 4.44)
	Liver/Gallbladder**	11	3.33 (1.66, 5.95)
	Uterus*	6	0.38 (0.14, 0.82)

Age-standardized incidence rate is significantly lower * or higher ** (p value ≤0.05) than Canada's sex-specific rate. Caution: Cancer sites with less than or equal to five cases are suppressed. The interpretation of sites with six to ten cases requires caution due to unstable rates (refer to confidence intervals). Sites with 11 to 20 events can also produce unstable rates (refer to confidence intervals).
Sources: NWT Cancer Registry (1992-2000) and Health Canada - Cancer Bureau (1996)

The following rates are noted (Table 5):

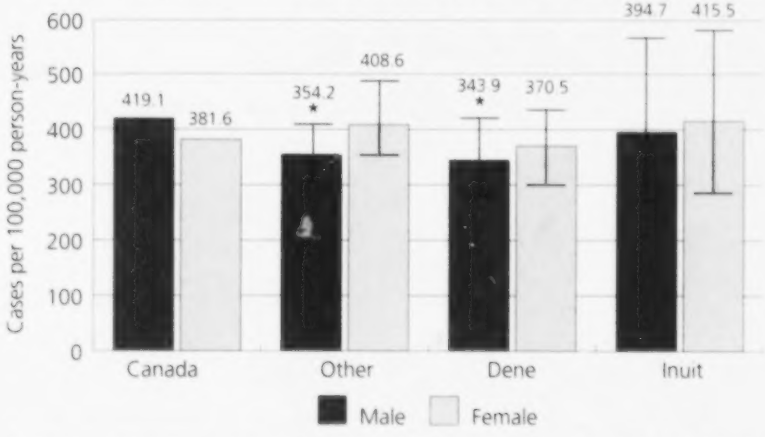
- The age-adjusted rate for colorectal cancer is almost 1.5 times higher among NWT males when compared to the rates of their Canadian counterparts.
- The risk for prostate cancer in NWT males is half the risk in Canadian males even though prostate cancer is the third most prevalent cancer among NWT males.
- The age-adjusted rate for stomach cancer in NWT males is 1.9 times the Canadian rate.
- The age-adjusted incidence rate for breast cancer is similar to the national rates even though breast cancer is the most prevalent cancer in females (refer to Appendix 5).
- Colorectal and lung cancer, which are the second and third most prevalent cancers in NWT females, have age-adjusted rates that are almost 1.7 and 1.4 times higher than the female national rate, respectively.
- The female rates for pancreatic, oral and liver/gallbladder cancers range from 2.5 to 3.3 times greater than the female national rate, although the confidence intervals are indicative of very imprecise estimates.

Cancer Incidence Rates by Ethnicity

When the cancer incidence rates for specific ethnic groups are adjusted for age, Non-Aboriginal/Métis and Dene males were respectively 15% and almost 20% less likely to have cancer than Canadian males (Figure 5). The female rates from each of the ethnic groups are similar to the female Canadian rate.

Figure 5

Age-standardized Cancer Incidence Rates by Ethnic Group (1992-2000)



Age-standardized incidence rate is significantly lower * (p value < 0.05) than Canada's sex-specific rate. "Other" includes Non-Aboriginals and Métis.

Sources: NWT Cancer Registry (1992-2000) and Health Canada - Cancer Bureau (1996)

Infection with Epstein-Barr virus (EBV) at an early age and with a larger dose of virus than in most other populations is believed to be at least part of the explanation for the extremely high incidence of nasopharyngeal cancer in all Inuit population.

Bjerregaard P, Young TK. "Chronic Diseases" in The Circumpolar Inuit: health of a population in transition. Munksgaard, Copenhagen. 1998.

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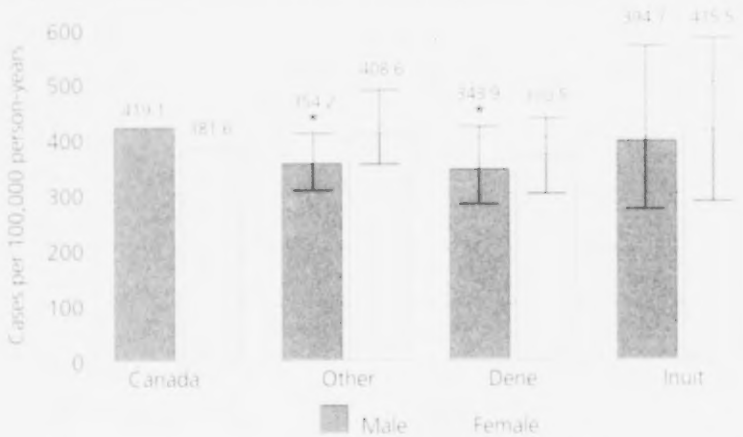

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The risk for prostate cancer among the Non-Aboriginal/Métis men is 35% lower than Canadians. For Dene males, the rate is more than 70% lower (Table 6). On the other hand, the age-adjusted rate for colorectal cancer among Dene males is 2.2 times greater than the national rate (Table 6).

The age-adjusted rate for colorectal cancer in Dene females is almost 1.9 times greater than the national rate and 2.5 times greater among Inuit females. The age-adjusted rates for pancreatic and oral cancer in Non-Aboriginal/Métis females were more than three times higher than the national rate. The rates for liver/gallbladder were 4.7 times higher in the Dene female population. The wide confidence intervals for these cancers (except for colorectal cancer in Dene females) suggest instability in the rates (Table 6).

Table 6
Cancers in Ethnic Groups with Age-adjusted Incidence Rates Lower or Higher than Canada

Gender	Ethnic Group	Cancer Site	Number of Cases (1992-2000)	Standardized Incidence Ratio (SIR) with Confidence Intervals
Males	Dene	Colorectal**	38	2.19 (1.55, 3.01)
		Prostate*	8	0.27 (0.12, 0.53)
	Other	Prostate*	27	0.65 (0.43, 0.95)
Females	Dene	Colorectal**	22	1.88 (1.18, 2.84)
		Liver/Gallbladder**	6	4.67 (1.71, 10.16)
	Inuit	Colorectal**	8	2.46 (1.06, 4.85)
	Other	Pancreas**	10	3.18 (1.53, 5.84)
		Oral**	9	3.10 (1.42, 5.88)

Age-standardized incidence rate is significantly lower * or higher ** (p value <0.05) than Canada's sex-specific rate. "Other" includes Non-Aboriginals and Métis.
Caution: Cancer sites with less than or equal to five cases are suppressed. The interpretation of sites with six to ten cases requires caution due to unstable rates (refer to confidence intervals). Sites with 11 to 20 events can also produce unstable rates (refer to confidence intervals).
Sources: NWT Cancer Registry (1992-2000) and Health Canada - Cancer Bureau (1996)

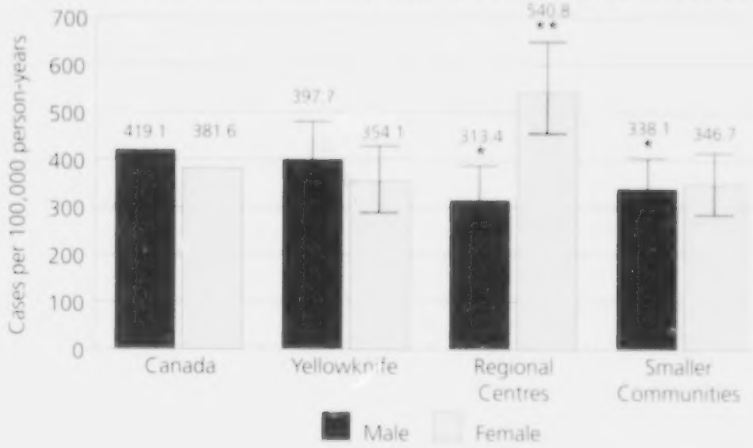
Cancer Incidence Rate by Community Type

The population size within most NWT communities is generally too small to perform community-level analyses. Thus, the data were aggregated according to three distinct community types: Yellowknife, "Regional Centres" (Hay River, Fort Smith and Inuvik), and "Smaller Communities" (the remaining communities in the NWT). Communities are categorized into one of these three community types based on similar socio-demographic factors.

Analyses similar to those presented in the previous section on ethnicity are performed to determine whether the observed number of newly diagnosed cancers is higher or lower than expected if Canadian age-specific rates existed in the community type. In general, males from smaller communities and regional centres have rates of almost 20% and 25% less than male Canadian rates (Figure 6). On the other hand, females from regional centres have rates

that are 40% higher than the rate in Canadian females (Figure 6). Males and females in Yellowknife and females in smaller communities have rates similar to their Canadian counterparts.

Figure 6
Age-standardized Cancer Incidence Rates by Community Type (1992-2000)



Age-standardized incidence rate is significantly lower * or higher ** (p value <0.05) than the gender-specific rate in Canada. Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT.
Sources: NWT Cancer Registry (1992-2000) and Health Canada - Cancer Bureau (1996).

Although the incidence rate for all cancers combined is lower among males in regional centres and smaller communities (Figure 6), the rate for stomach cancer in regional centres and for colorectal cancer in smaller communities was almost 2.9 and 1.8 times the male Canadian rate (Table 7). Meanwhile, the number of prostate cancers remains less than half of what would be expected, especially within regional centres and smaller communities.

The rate for colorectal cancer is 1.7 times higher among females in smaller communities and 2.2 times greater in regional centres. In Yellowknife, the rate for pancreatic cancer is 4.2 times higher. In regional centres, the rate of oral cancer is almost seven times the Canadian value. Once again the confidence intervals for the SIR are relatively wide, indicating unstable rates. The rate for lung and kidney cancer among females in smaller communities is 1.8 and 2.7 times the female rate in Canada.

The pattern of cancer among the Inuit can be used as a marker of social and cultural change. Schaefer noted a decline in the proportion of the "traditional" (salivary, nasopharyngeal, esophageal) relative to the "modern" (lung, cervix, colon, and breast) cancers between 1950 and 1966 and between 1974 and 1980 in the central and western Canadian Arctic.

Hildes JA, Schaefer O. The changing picture of neoplastic disease in the western and central Canadian Arctic (1950-1980). Canadian Medical Association Journal 1984; 130:25-33

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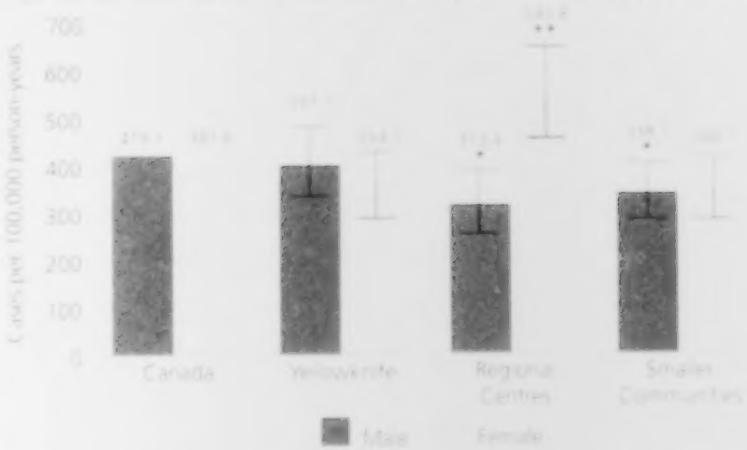

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Table 7
Cancers in Community Types with Age-adjusted Incidence Rates Lower or Higher than Canada

Gender	Community Type	Cancer Site	Number of Cases (1992-2000)	Standardized Incidence Ratio (SIR) with Confidence Intervals
Males	Regional Centres	Prostate*	10	0.44 (0.21, 0.80)
		Stomach**	9	2.89 (1.32, 5.48)
	Smaller Communities	Colorectal**	39	1.81 (1.28, 2.47)
		Prostate*	12	0.33 (0.17, 0.58)
Females	Yellowknife	Pancreas**	8	4.15 (1.79, 8.18)
	Regional Centres	Colorectal**	18	2.18 (1.29, 3.44)
		Oral**	9	6.95 (3.18, 13.20)
	Smaller Communities	Lung**	24	1.83 (1.17, 2.73)
		Colorectal**	21	1.65 (1.02, 2.53)
		Kidney**	7	2.70 (1.09, 5.57)

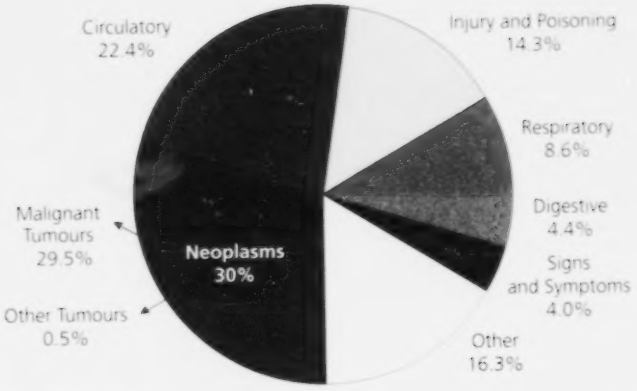
Age-standardized incidence rate is significantly lower * or higher ** (p value <0.05) than Canada's sex-specific rate. Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT. Caution: Cancer sites with less than or equal to five cases are suppressed. The interpretation of sites with six to ten cases requires caution due to unstable rates (refer to confidence intervals). Sites with 11 to 20 events can also produce unstable rates (refer to confidence intervals).
Sources: NWT Cancer Registry (1992-2000) and Health Canada - Cancer Bureau (1996).

Cancer Mortality (1990-1999)

Leading Cause of Death in the NWT

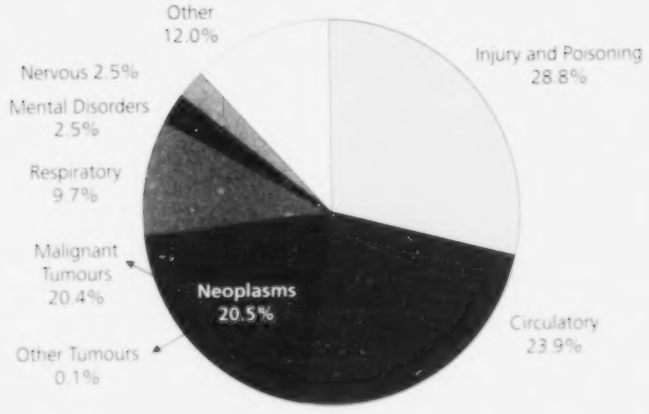
Neoplasms (which represent malignant, benign and in situ tumours) are the leading cause of death in the NWT during the period from 1990 to 1999, representing almost one out of every four deaths. The majority of neoplasm deaths are due to malignant tumours. In Canada, neoplasms were the second leading cause of death (28% of all deaths) in 1996. For females in the NWT, neoplasms are responsible for 30% of all deaths (Figure 7). For males, neoplasms are the cause of 21% or one out of every five deaths, making it the third leading cause of death in males following injuries and poisonings, and cardiovascular disease (Figure 8).

Figure 7
Causes of Death in NWT Females by ICD-9 Chapter (N=526)



Source: NWT Vital Statistics (1990-1999)

Figure 8
Causes of Death in NWT Males by ICD-9 Chapter (N=907)



Source: NWT Vital Statistics (1990-1999)

Mortality Trends

During the period from 1990 to 1999, cancer accounts for an average of 34 deaths per year. The number of deaths per year range from 13 to 23 in males and from 7 to 23 in females. Without taking into consideration the population size at risk, an increasing trend in the number of cancer deaths seems apparent in women (Figure 9). The calculation of rates will provide further information as to whether a trend exists or not.

Figure 7
Causes of Death in NWT Females by ICD-9 Chapter (N=520)

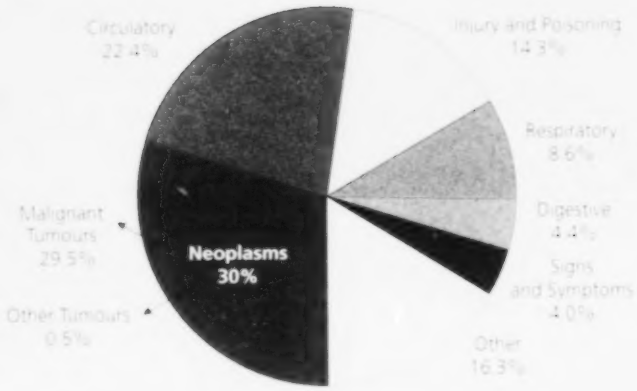


Figure 8
Causes of Death in NWT Males by ICD-9 Chapter (N=807)

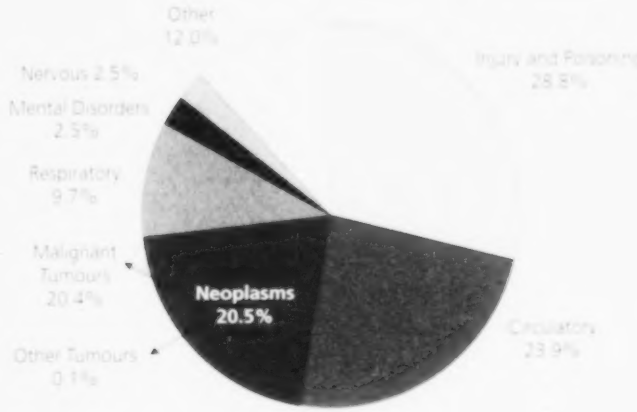


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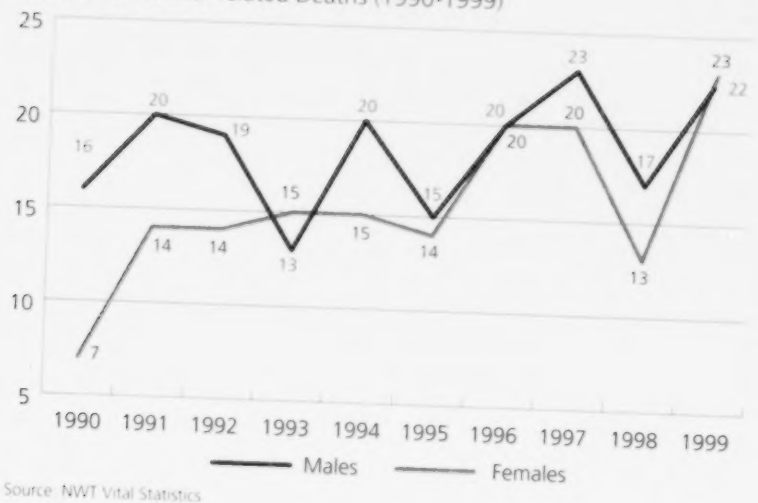
Figure 9
Number of Cancer-related Deaths (1990-1999)

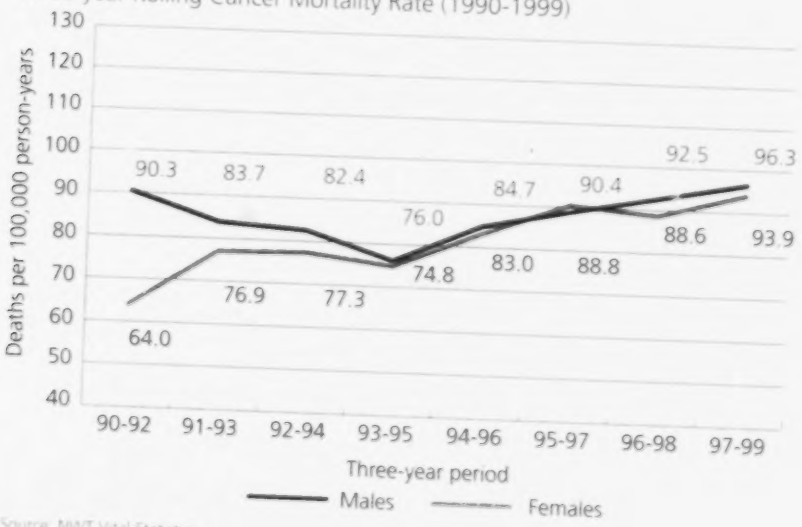


Source: NWT Vital Statistics

The three-year rolling average for female mortality rate shows an increase of 47% from 64 to 94 deaths per 100,000 person-years between 1990-1992 and 1997-1999 (Figure 10). However, this apparent trend vanishes when the year-to-year differences in age distribution are taken into account. Thus, the increasing age in the female population accounts largely for this phenomenon.

As with findings for incidence, the cancer mortality rates are similar between men and women.

Figure 10
Three-year Rolling Cancer Mortality Rate (1990-1999)



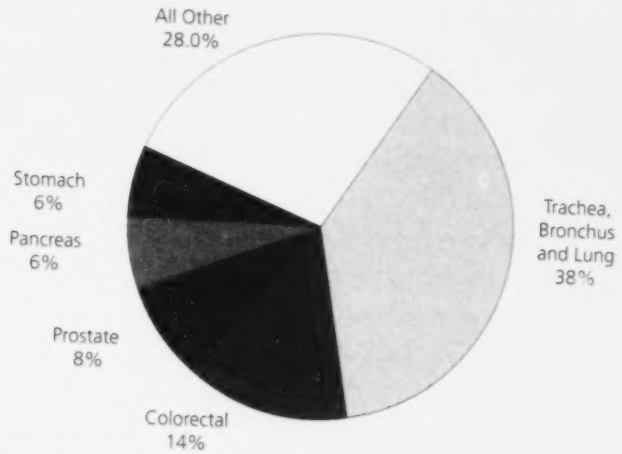
Source: NWT Vital Statistics

Distribution of Cancer Deaths

Figures 11 and 12 show the distribution of cancer-related deaths for males and females. Even though lung cancer accounts for less than one out of every five diagnoses, it is responsible for almost a third of all cancer deaths.

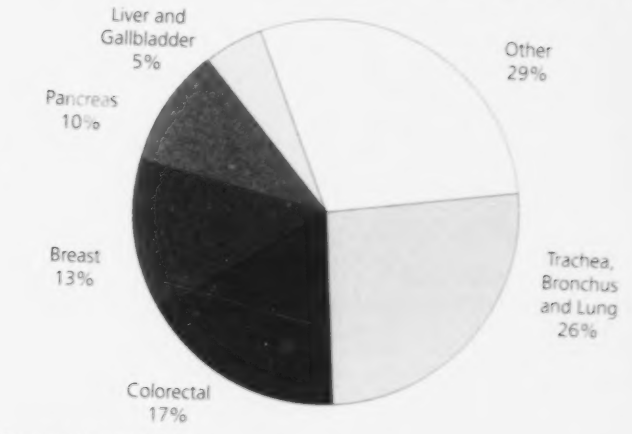
Colorectal cancer is the second most common form of cancer-related deaths, followed by prostate and breast cancer. This pattern is also observed for the different ethnic groups and community types (Tables 8 and 9).

Figure 11
Distribution of Male Cancer Deaths (1990-1999) (n=185)



Source: NWT Vital Statistics

Figure 12
Distribution of Female Cancer Deaths (1990-1999) (n=155)



Source: NWT Vital Statistics

Table 8a
Top Three Cancer Deaths in Males by Ethnic Group

		Male		
		Dene (n=73)	Inuit (n=26)	Other (n=86)
Rank	1	Trachea, Bronchus and Lung (36%)	Trachea, Bronchus and Lung (39%)	Trachea, Bronchus and Lung (38%)
	2	Colorectal (18%)	x	Colorectal (12%)
	3	Stomach (10%)	x	Prostate (11%)

"Other" includes Non-Aboriginals and Metis. X = cells with less than five deaths are suppressed. N values represent the number and % values represent the proportion of cases in each gender-specific ethnic group.
Source: NWT Vital Statistics (1990-1999)

Table 8b
Top Three Cancer Deaths in Females by Ethnic Group

		Female		
		Dene (n=55)	Inuit (n=22)	Other (n=78)
Rank	1	Colorectal (20%) Trachea, Bronchus and Lung (20%)	Trachea, Bronchus and Lung (36%)	Trachea, Bronchus and Lung (27%)
	2		Colorectal (23%)	Breast (15%)
	3	Breast (13%)	x	Colorectal (14%)

"Other" includes Non-Aboriginals and Metis. X = cells with less than five deaths are suppressed. N values represent the number and % values represent the proportion of cases in each gender-specific ethnic group.
Source: NWT Vital Statistics (1990-1999)

Table 9a
Top Three Cancer Deaths in Males by Community Type

		Male		
		Yellowknife (n=48)	Regional Centres (n=45)	Smaller Communities (n=92)
Rank	1	Trachea, Bronchus and Lung (42%)	Trachea, Bronchus and Lung (27%)	Trachea, Bronchus and Lung (40%)
	2	Prostate (13%)	Colorectal (13%)	Colorectal (15%)
	3	Colorectal (10%)	Stomach (11%)	Prostate (7%) Pancreas (7%) Liver and Gallbladder (7%)

Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT. N values represent the number and % values represent the proportion of cases in each gender-specific community type.
Source: NWT Vital Statistics (1990-1999)

Table 9b
Top Three Cancer Deaths in Females by Community Type

		Female		
		Yellowknife (n=45)	Regional Centres (n=50)	Smaller Communities (n=60)
Rank	1	Trachea, Bronchus and Lung (27%)	Colorectal (20%) Trachea, Bronchus and Lung (20%)	Trachea, Bronchus and Lung (30%)
	2	Colorectal (20%)		Colorectal (13%) Breast (13%)
	3	Breast (16%) Pancreas (16%)	Breast (10%)	

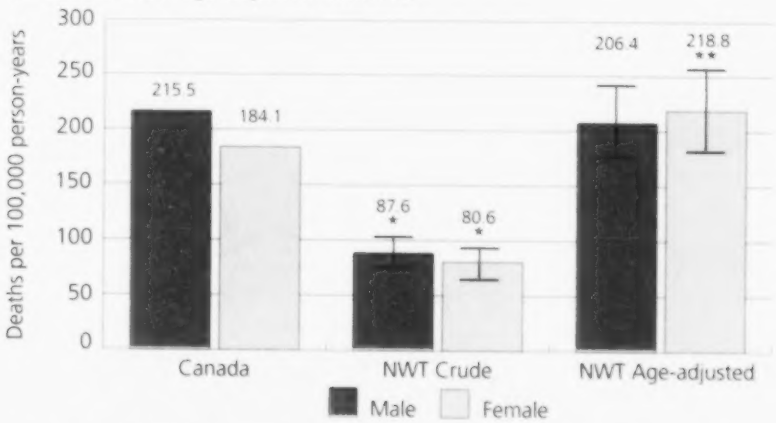
Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT. N values represent the number and % values represent the proportion of cases in each gender-specific community type.
Source: NWT Vital Statistics (1990-1999)

Comparison of NWT Cancer Mortality Rates to National Rates

The male and female crude mortality rates in the NWT are less than half their counterpart national rates (Figure 13). When NWT mortality rates are adjusted for age, the NWT female rate is almost 20% higher than the Canadian female rate. On the other hand, the mortality rate for NWT males is similar to Canadian males.

The age-adjusted mortality rates for lung and colorectal cancer are almost 50% and 80% higher in NWT females compared to Canadian females (Table 10). Meanwhile, the female rates for pancreatic and liver/gallbladder cancer are 2.7 and 3.6 times the Canadian rates, however, the wide confidence intervals seem to indicate unstable values.

Figure 13
NWT and Canada Cancer Mortality Rate
(Crude vs. NWT Age-adjusted Statistics)



Rate is significantly lower * or higher ** (p value <0.05) than the gender specific rate in Canada.
Sources: NWT Vital Statistics (1990-1999) and Health Canada - Cancer Bureau (1996)

Table 10
Cancer Deaths in the NWT with Rates Lower or Higher than Canada

Gender	Cancer Site	Number of Deaths (1990-1999)	Standardized Mortality Ratio (SMR) with Confidence Intervals
Females	Lung**	40	1.46 (1.04, 1.99)
	Colorectal**	27	1.81 (1.20, 2.64)
	Pancreas**	16	2.69 (1.54, 4.37)
	Liver/Gallbladder*	8	3.58 (1.54, 7.04)

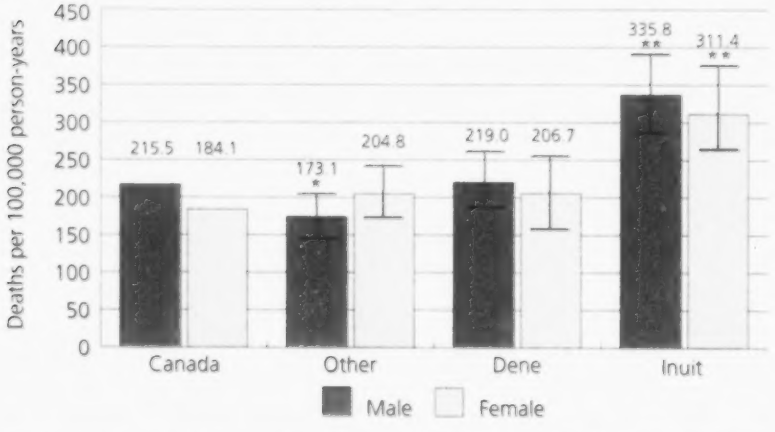
Age-standardized mortality rate is significantly lower * or higher ** (p value <0.05) than Canada's sex-specific rate. Caution: Cancer sites with less than or equal to five deaths are suppressed. The interpretation of sites with six to ten deaths requires caution due to unstable rates (refer to confidence intervals). Sites with 11 to 20 events can also produce unstable rates (refer to confidence intervals).
Sources: NWT Vital Statistics (1990-1999) and Health Canada - Cancer Bureau (1996)

Cancer Mortality Rates by Ethnicity

Among the male and female Inuit population, the cancer mortality age-adjusted rates are more than 55% and almost 70% higher than Canadian rates (Figure 14). Because the incidence rates are similar to Canada, these higher cancer mortality rates could imply late diagnosis and treatment leading to poorer cancer outcomes in the Inuit population. In order to test this hypothesis, data such as stage of diagnosis would have to be collected and analyzed.

Males from the Non-Aboriginal/Métis group have 20% lower than expected cancer-related deaths. All other NWT rates were comparable to Canadian rates.

Figure 14
Age-standardized Cancer Mortality Rates by Ethnic Group (1990-1999)



Age-standardized mortality rate is significantly lower * or higher ** (p value < 0.05) than the gender-specific rate in Canada. "Other" includes Non-Aboriginal and Métis.
Sources: NWT Vital Statistics (1990-1999) and Health Canada - Cancer Bureau (1996)

For the ethnic groups in Table 11, the age-adjusted mortality rate for lung cancer among the female Inuit is 2.8 times the rate among Canadian females. If lung cancer-related deaths are removed, the difference between Inuit age-adjusted and Canadian mortality rates decreases by approximately 55% for both males and females.

The female Non-Aboriginal/Métis population has an age-adjusted rate for pancreatic cancer that is 3.1 times the rate in Canadian females.

Table 11
Cancers in Ethnic Groups with Age-adjusted Mortality Rates Lower or Higher than Canada

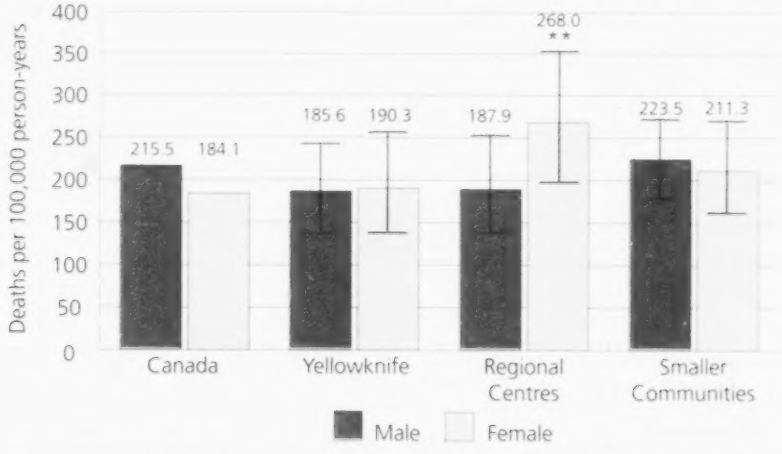
Gender	Ethnic Group	Cancer Site	Number of Deaths (1990-1999)	Standardized Mortality Ratio (SMR) with Confidence Intervals
Females	Inuit	Lung**	8	2.83 (1.22, 5.58)
	Other	Pancreas**	9	3.06 (1.40, 5.81)

Age-standardized mortality rate is significantly lower * or higher ** (p value <0.05) than Canada's sex-specific rate. "Other" includes Non-Aboriginals and Métis. Caution: Cancer sites with less than or equal to five deaths are suppressed. The interpretation of sites with six to ten deaths requires caution due to unstable rates (refer to confidence intervals). Sites with 11 to 20 events can also produce unstable rates (refer to confidence intervals).
Sources: NWT Vital Statistics (1990-1999) and Health Canada - Cancer Bureau (1996)

Cancer Mortality Rates by Community Type

In addition to having higher age-adjusted incidence rates (Figure 6), females living in regional centres also have cancer mortality rates that are almost 50% higher than the rates in female Canadians (Figure 15).

Figure 15
Age-standardized Cancer Mortality Rates by Community Type (1990-1999)



Age-standardized mortality rate is significantly lower * or higher ** (p value < 0.05) than the gender-specific rate in Canada. Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT.
Sources: NWT Vital Statistics (1990-1999) and Health Canada - Cancer Bureau (1996)

In Table 12, the male mortality rate for liver/gallbladder cancer in smaller communities is 3.3 times greater than the national male rate. The female mortality rates for colorectal cancer in regional centres and for pancreatic cancer in Yellowknife are more than 2.6 and 4.1 times greater than the rate for Canadian females. Once again, the wide confidence intervals suggest unstable rates.

Table 12
Cancers Deaths in Community Types with Rates Lower or Higher than Canada

Gender	Community Type	Cancer Site	Number of Deaths (1990-1999)	Standardized Mortality Ratio (SMR) with Confidence Intervals
Males	Smaller Communities	Liver/Gallbladder**	6	3.28 (1.21, 7.15)
Females	Yellowknife	Pancreas**	7	4.06 (1.63, 8.35)
	Regional Centres	Colorectal**	10	2.60 (1.25, 4.77)

Age-standardized mortality rate (ASR) is significantly lower * or higher ** (p value <0.05) than Canada's sex-specific rate. Regional centres include Fort Smith, Hay River and Inuvik. Smaller communities include all other communities in the NWT. Caution: Cancer sites with less than or equal to five deaths are suppressed. The interpretation of sites with six to ten deaths requires caution due to unstable rates (refer to confidence intervals). Sites with 11 to 20 events can also produce unstable rates (refer to confidence intervals).
Source: NWT Vital Statistic (1990-1999) and Health Canada - Cancer Bureau (1998)

An Age-related Disease

Table 13 illustrates the average age of diagnosis for the various types of cancer which had ten or more cases during the nine-year period of 1992 to 2000. The average age of diagnosis in males was 59.4 years and 55.3 years for females.

Table 13
Average Age of Cancer Diagnosis, NWT (1992-2000) (n≥10)

	Male		Female	
	Cases (n)	Average Age at Diagnosis	Cases (n)	Average Age at Diagnosis
All Sites	334	59.4	342	55.3
Colorectal	74	62.9	53	65.6
Lung	65	64.6	49	62.4
Breast	-	-	96	52.8
Prostate	38	67.1	-	-
Stomach	22	58.9	5	-
Oral	14	53.7	13	58.0
Pancreas	9	-	15	60.9
Kidney	12	66.7	12	49.2
Non-Hodgkin's Lymphoma	18	45.6	5	-
Malignant Melanoma	10	46.0	13	47.5
Liver and Gallbladder	10	64.1	11	63.2

Table 13 continued
Average Age of Cancer Diagnosis, NWT (1992-2000) (n≥10)

	Male		Female	
	Cases (n)	Average Age at Diagnosis	Cases (n)	Average Age at Diagnosis
Ovary	-	-	15	45.9
Bladder	12	60.3	3	-
Cervix	-	-	13	50.3
Testis	11	35.5	-	-

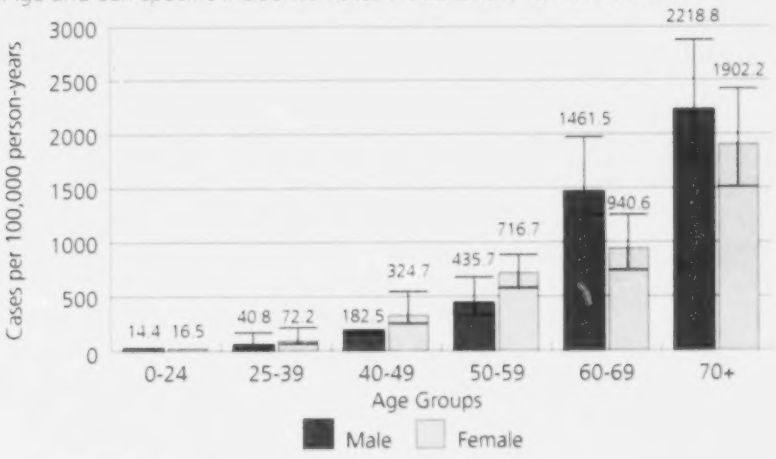
Source: NWT Cancer Registry

Figures 16 and 17 show an increase in rates for cancer incidence after the age of 40 and after the age of 50 for cancer mortality. Among the cancers diagnosed between 1992 and 2000, 41% occur in individuals aged 40 to 59 years of age and 46% within adults 60 and older. As for cancer-related deaths between 1990 and 1999, 24% are among individuals 40 to 59 years of age and 64% among those 60 years and older.

Upon examining the age-specific incidence rates, females in the 40 to 49 and 50 to 59 age groups have higher rates than males (Figure 16). Since the age at diagnosis for lung and colorectal cancer are relatively similar in males and females, the higher rates in females is most likely driven by the cases of breast cancer in which the average age at diagnosis is 52.8 years. In addition, kidney cancer, which is similarly prevalent in both males and females in the NWT, has an average age at diagnosis of 49 years for females, yet 67 years for males.

The incidence and mortality rates among males in the 60 to 69 and 70+ age groups seem higher than the female rates. However, these are not statistically significant differences (Figure 16 and 17).

Figure 16
Age and Sex-specific Incidence Rates (1992-2000) for All Cancers



Source: NWT Cancer Registry

"The trends in young adults are, I suggest, by far the most important for assessing our progress against cancer for two reasons. First, because the trends can reflect only relatively recent changes in the prevalence of carcinogenic agents and are not confused by the effects of changes in the distant past and, second, because young people tend to adopt new habits before the old."

Doll R. Progress against cancer: An epidemiologic assessment. The 1991 John C. Cassel Memorial Lecture. American Journal of Epidemiology 1991; 134: 675-688

	Male		Female	
	Cases (n)	Average Age at Diagnosis	Cases (n)	Average Age at Diagnosis
Ovary	–	–	15	45.9
Bladder	12	60.3	3	–
Cervix	–	–	13	50.3
Testis	11	35.5	–	–

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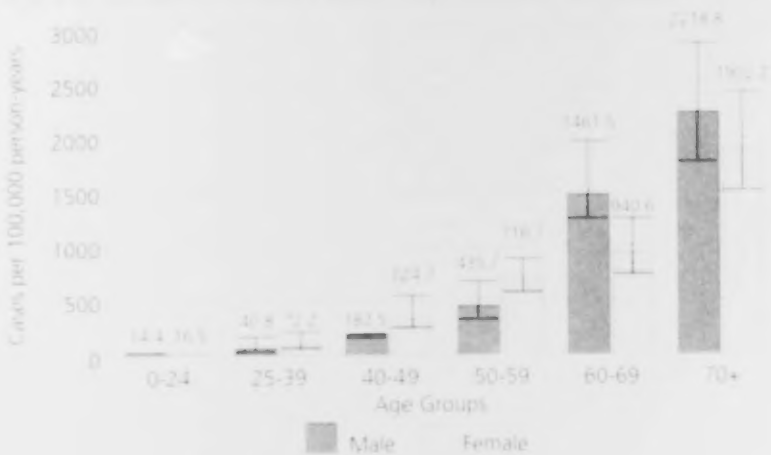
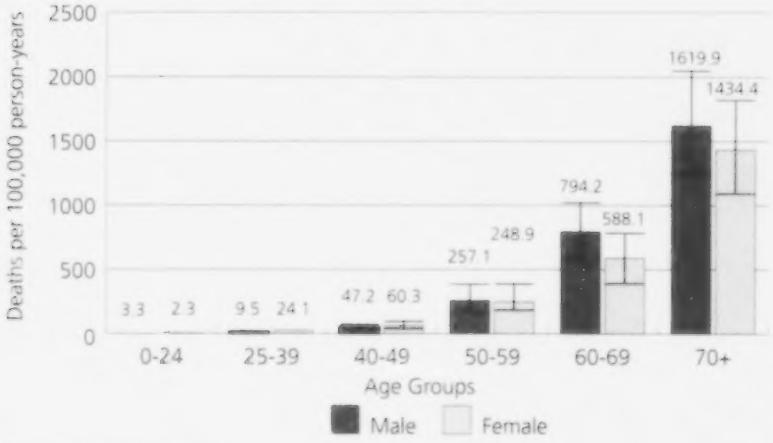


Figure 17
Age and Sex-specific Morality Rates (1992-2000) for All Cancers Sites



Source: Vital Statistics Registry

Service Delivery and Human Costs of Cancer

In 1999, 21% of the population was represented by individuals 45 years or older. This amounts to almost 8,700 people.[2] Within this age group, 67 people were newly diagnosed with cancer and 42 died from the disease. By 2009, this age group is estimated to increase by 45% to more than 13,000 people, comprising 28% of the NWT population.[3] Given the growing senior population, it is reasonable to anticipate that crude cancer rates will continue to increase over the next decade.

Based on health service utilization from 1994 to 1999, cancer services for malignant tumours are estimated to have cost 2.3 million dollars in 2001-2002. Meanwhile, the healthcare expenditures for services on neoplasms are estimated at 3.1 million dollars. In addition to services for malignant tumours, costs for neoplasms can include biopsies and treatment for benign and in situ tumours and regular cancer screening (e.g. for breast, cervix, colorectal or prostate). It is important to note that both estimates include costs for hospitalization, physician services and medical travel, but do not include costs for medications, long-term care and home care.

The economic costs will increase along with the overall cancer incidence. Furthermore, the emergence of more effective, complex and expensive drugs and methods of treatment will also contribute to the increase in costs.

In addition, there are human costs that cannot be quantified (e.g. grief and suffering of cancer patients, survivors, families and friends). Many emotional, physical and financial demands are placed on family caregivers throughout the

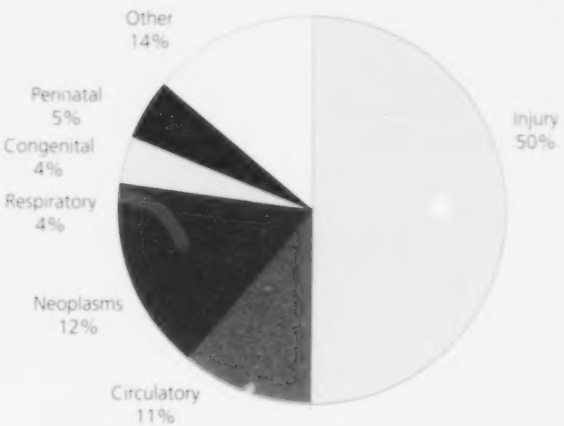
course of illness. Often family members will remain at home to care for their loved ones. Costs such as these can have long-term effects on both caregivers and society.

Potential Years of Life Lost

The potential years of life lost (PYLL) indicator is often used to measure the impact of disease in a population. It attempts to quantify premature mortality and, thus, the loss of productivity to society. A high value can indicate a large number of deaths as a result of the specified disease and/or signify that deaths are occurring at a younger age in comparison to other conditions. Nationally, cancer is the greatest contributor, accounting for 29% of PYLL to all causes of death (1996).[4]

Although cancer figures prominently in the number of potential years of life lost, there is a marked difference between males and females. Of the approximately 19,600 PYLL by NWT males between 1990 and 1999 (Figure 18), 51% are due to injuries and/or poisoning and 12% due to neoplasms. Of the approximately 9,200 potential years of life lost by NWT females (Figure 19), neoplasms contribute more prominently (23%) than it does in males (12%). This is primarily because injury deaths are less frequent in women than men.

Figure 18
Potential Years of Life Lost (PYLL) in NWT Males Before Age 75 (n=19,559 PYLL)



Hospitalization for diagnostic work-up, initial surgery, palliation and terminal care is often the main driver for costs associated with cancer.

Phyllis Will B., White K., and Berthelot J-M. Modelling the burden of cancer in Canada. ...Au Courant, Sept. 2002

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Phyllis Wall R., White K., and Berthelot J.M. Modelling the burden of cancer in Canada — An Overview. Sept. 2002.

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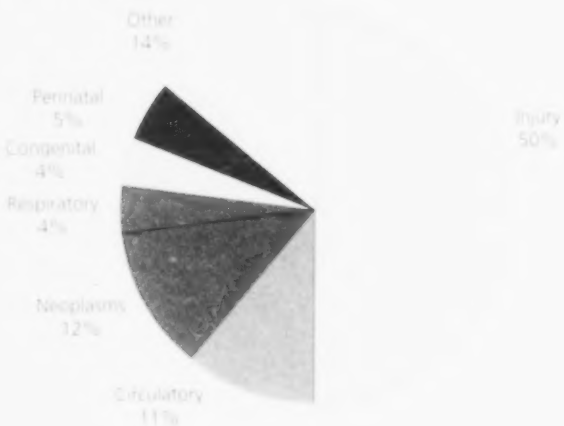

Figure 19
Potential Years of Life Lost (PYLL) in NWT Females Before Age 75 (n=9,193 PYLL)

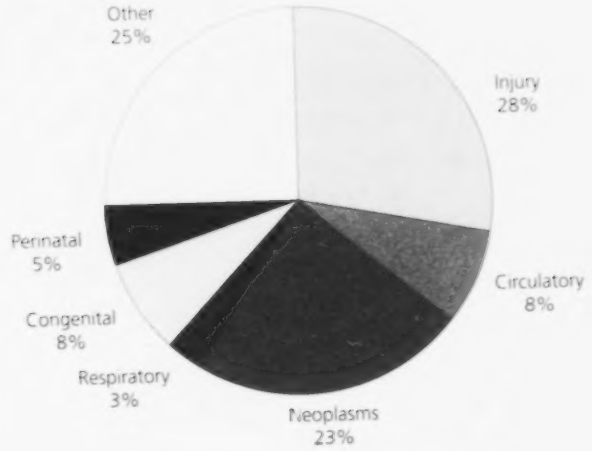

Table 14 summarizes the PYLL for all deaths, for all malignant cancer-related deaths and for deaths among specific cancer sites. The average PYLL per year due to cancer is 430, split almost equally between males and females. Lung cancer accounts for 28% of all PYLL due to cancer in males and 18% of all PYLL due to cancer in females.

Table 14
Potential Years of Life Lost Due to Cancer, NWT (1990-1999)

	Males		Females	
	Years	%	Years	%
All Causes	19559	-	9193	-
All Malignant Cancers	2188	100%	2115	100%
Lung	618	28%	385	18%
Colorectal	353	16%	300	14%
Breast	-	-	360	17%
Pancreas	135	6%	208	10%
Stomach	150	7%	140	7%
Prostate	105	5%	-	-
All Other	828	38%	723	34%

Cancer Survival

Cancer survival can depend on various factors such as:

- type of cancer;
- age at diagnosis;
- gender;
- disease stage and progression;
- site of disease;
- existence of other illnesses;
- availability of cancer treatments and supportive care;
- socio-economic status;
- differences in diagnostic techniques; and/or
- health status prior to disease.

Statistics Canada calculated five-year relative survival rates for Canadians diagnosed with primary breast, colorectal, lung or prostate cancers in 1992.[5] These cancer statistics measure a patient's risk of dying compared to the general population. Using Statistics Canada's analyses, lung and colorectal cancer have low survival rates compared to breast or prostate cancer. Such rates could not be calculated specifically for NWT due to small numbers.

Another way to portray survival is to look at the number of cancer deaths versus the number of cancer diagnoses made within a particular period. It is important to note that those who died of cancer may not necessarily be the same individuals diagnosed during that same period. A ratio of 30% or less signifies a very good prognosis. Greater than 30%, but less than 50%, implies a fairly good prognosis. Meanwhile, a ratio greater than 50% suggests a poor prognosis.[6]

Table 15 illustrates the prognoses of various cancers in the Northwest Territories, using data from the period of 1992 to 1999. Lung, pancreatic and stomach cancer each have poor prognoses, whereas breast, malignant melanoma and ovarian cancer have very good prognoses in the NWT.

For purposes of comparison, the deaths to case ratio for Canada is also presented next to the NWT data. In Canada, the prognosis for breast cancer is fairly good, whereas it is very good in NWT. In addition, the prognosis for ovarian cancer is poor in Canada, yet very good in NWT. For the remaining cancers, the Canadian and NWT ratios are well within similar categories for prognosis.

Survival after breast or prostate cancer decreases at a more constant rate than either that of lung or colorectal cancer. Five and ten-year survival rates for breast and prostate cancers are better overall than for lung and colorectal cancers.

Alberta Cancer Board. Cancer in Alberta: A Regional Picture, July 2002

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Survival after breast or prostate cancer decreases at a more constant rate than either that of lung or colorectal cancer. Five and ten-year survival rates for breast and prostate cancers are better overall than for lung and colorectal cancers.

[3] NWT Cancer Board, Cancer in Canada: A National Picture, May 2002

Table 15
Ratio of NWT Cancer Deaths per Cases Diagnosed (1992-1999)

Cancer Site	Male		Female		Both	
	NWT (1992-1999)	Canada (1995)	NWT (1992-1999)	Canada (1995)	NWT (1992-1999)	Canada (1995)
Breast	-	-		31%		31%
Colorectal	32%	39%	35%	39%	34%	39%
Kidney	33%	34%	31%	34%	32%	34%
Lung	91%	87%	77%	79%	85%	84%
Melanoma						
Non-Hodgkin's Lymphoma	31%	45%	*	50%	45%	47%
Ovary	-	-		61%		61%
Pancreas**	125%	104%	115%	97%	119%	100%
Prostate	41%	26%	-	-	41%	26%
Stomach	50%	64%	*	77%	64%	69%
All Sites	51%	51%	44%	47%	48%	49%

Very good prognosis – less than 30%
Fairly good prognosis – 30% to 50%
Poor prognosis – greater than 50%

* Five or less cases in numerator and/or denominator.
** The high percentage (in excess of 100%) for cancer of the pancreas can result from an incomplete registration of a cancer before death.

Cancer Control

In anticipation of the overwhelming national burden due to cancer, a Canadian strategy has been elaborated to address the issues on cancer control. Over 700 volunteer experts, cancer survivors, allied health professionals and caregivers participated in the creation of this strategy, which brings about a co-ordinated, comprehensive and collaborative national approach to cancer control.[7]

According to the Canadian Strategy for Cancer Control, cancer control aims to prevent cancer, cure cancer, and increase survival and quality of life for those who develop cancer by converting the knowledge gained through research, surveillance and outcome evaluation into strategies and actions.[8] Thus, cancer control should encompass all aspects of cancer-related interventions, at both the individual and the population-based levels, for those affected by cancer as well as healthy populations.

A framework for cancer control has been developed that is based on these elements (Figure 20). The phases of intervention (the outside layer) are based on various points in the natural history of cancer (the middle layer). In the centre, the individual's health status is governed by the determinants of health. Meanwhile, the foundation includes the activities, initiatives and structures in which the individual and the system is embedded. For most, the experience in this continuum is limited to prevention initiatives that decrease their risk of cancer and screening programs for the early detection of cancer. When a diagnosis of cancer is confirmed, patients then receive medical treatment, in addition to supportive care, rehabilitation and/or palliative care interventions.

Figure 20
A Framework for Cancer Control

- Phases of Intervention
- Natural History of Disease
- Determinants of Health
- Foundation for Cancer Control Activities, Initiatives and Stuctures

Source: Canadian Strategy for Cancer Control Action Plan – January 2002, pg. 8

In the NWT, the number of people experiencing cancer is expected to increase as the population ages. This will result in an increased demand for cancer-related care. Cancer control in the NWT does require attention, although a strategy specific to the NWT would need to be developed.

Cancer control aims to prevent cancer, cure cancer, and increase survival and quality of life for those who develop cancer, by converting the knowledge gained through research, surveillance and outcome evaluation into strategies and actions.

Canadian Strategy for Cancer Control

Cancer is the disease Canadians most fear. One in three Canadians develops cancer during their lifetime and one half of these will become long-term survivors. Most Canadians know at least one person affected by cancer.

The projected cancer burden represents an unprecedented challenge to sustaining Canada's healthcare system.

We cannot stop the Canadian population from aging, nor can we control the increased demand for cancer related care for this aging population in the foreseeable future.

Canadian Strategy for Cancer Control

Table 15

Cancer Site	Male		Female		Both	
	NWT (1992-1999)	Canada (1995)	NWT (1992-1999)	Canada (1995)	NWT (1992-1999)	Canada (1995)
Breast	-	-	19%	31%	19%	31%
Colorectal	32%	39%	35%	39%	34%	39%
Kidney	33%	34%	31%	34%	32%	34%
Lung	91%	87%	77%	79%	85%	84%
Melanoma	11%	24%	8%	16%	10%	20%
Non-Hodgkin's Lymphoma	31%	45%	*	50%	45%	47%
Ovary	-	-	7%	61%	7%	61%
Pancreas	125%	104%	115%	97%	119%	100%
Prostate	41%	26%	-	-	41%	26%
Stomach	50%	64%	*	77%	64%	69%
All Sites	51%	51%	44%	47%	48%	49%

Very good prognosis – less than 30%

Fairly good prognosis – 30% to 50%

Poor prognosis – greater than 50%

Cancer Control

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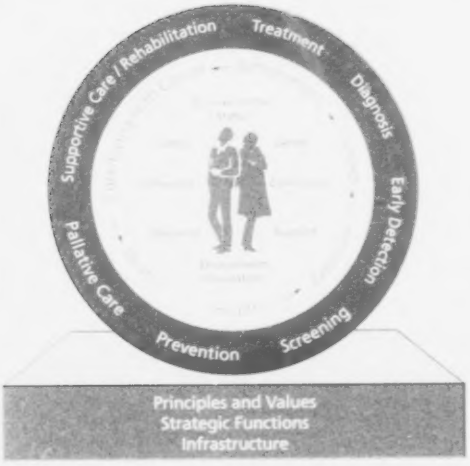
Figure 20



Cancer control aims to prevent cancer, cure cancer, and increase survival and quality of life for those who develop cancer, by converting the knowledge gained through research, surveillance and outcome evaluation into strategies and actions.

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In the NWT, the number of people experiencing cancer is expected to increase as the population ages. This will result in an increased demand for cancer-related care. Cancer control in the NWT does require attention, although a strategy specific to the NWT would need to be developed.

Prevention

Primary prevention is achieved when a disease is altogether avoided. The best strategy to reduce the incidence of cancer and cancer-related deaths in a given population is to promote wise lifestyle choices. Reducing the risks for cancer can have a great impact on the overall health of the population. At least 50% of cancer cases and deaths are preventable through healthier lifestyle choices.[9,10,11]

Smoking

Smoking is the number one cause of preventable death, is the cause of approximately 30% of all cancer deaths[12] and the leading cause of 87% of lung cancers.[13] In the NWT, lung cancer accounted for 32% of all cancer deaths during the period from 1990 to 1999.

Besides lung cancer, tobacco use is associated with cancers of the mouth, pharynx, larynx, esophagus, stomach, pancreas, kidney, urinary bladder and cervix. Recent evidence also associates smoking with breast cancer, liver cancer and some forms of leukemia.[14] Chewing tobacco and snuff are also associated with cancers of the mouth and larynx.

Since 1995, lung cancer has exceeded breast cancer as the leading cause of cancer deaths in females nationwide.[15] Some research suggests that women who smoke the same amount as men are more susceptible to the development of lung cancer.[16]

Lung cancer is a highly lethal disease and few people live longer than five years after diagnosis.[17] In addition, Health Canada estimates that at least 330 non-smokers die each year in this country from lung cancer due to exposure to second-hand smoke.

Smoking rates in the NWT point to a significant public health issue. For example:

- Smoking rates in the NWT are nearly twice the national rate. According to the Canadian Community Health Survey (CCHS), an estimated 46% of NWT residents 12 years of age and older smoked in 2000-2001, compared to 26% in Canada as a whole.[18]
- 51% of individuals who live in smaller communities smoke, as compared to 42% living in larger regional centres.[19]
- An estimated 40% of non-smokers in the NWT indicate exposure to second-hand smoke on most days, compared to 28% in the rest of Canada.[20]

Cancer risk can be reduced if the smoker stops early in life. When a smoker quits, health benefits are experienced immediately and increase steadily. Within 10 years, the risk of developing lung cancer drops to about one-third to one-half that of a continuous smoker.[21]

Recognizing the severity of this public health issue, the GNWT has adopted a tobacco strategy, Action on Tobacco, with the following four long-term goals:

- **Prevention** – ensure that people who do not smoke, never start;
- **Protection** – protect people, especially children, from Environmental Tobacco Smoke;
- **Cessation** – help and support people who want to stop smoking; and
- **Denormalization** – change attitudes toward smoking so people see it as an unhealthy and an undesirable behaviour.[22]

This strategy includes actions to improve legislation, programming, supports, enforcement, public awareness, and community-based initiatives.

If these and other initiatives could effect a 10% reduction in smoking prevalence rates, this could in turn result in a 17% decrease in the incidence of smoking-related cancers.[e] [23] In addition, if young people quit smoking today, a larger number of cancers could be prevented in the future.

Nutrition and Obesity

Fresh, frozen, canned and dried fruits and vegetables are all healthy food choices when it comes to cancer prevention. The Canada Food Guide recommends the consumption of at least five servings of fruits and vegetables every day. This food choice can decrease the risk of getting cancer by 20%.[24] Evidence indicates that poor nutrition (e.g. excess caloric intake or high fat consumption) can increase the risk of breast, colorectal and prostate cancers.[25] In addition, some fruits and vegetables such as broccoli and soybeans may be highly protective against certain types of cancer.

- In 2000-2001, only 26% of NWT residents aged 12 years and older consumed the daily recommendation of fruits and vegetables (19% males, 33% females), compared to 37% of the Canadian population.[f]

Preserved, smoked, pickled or salted foods may also increase risk for stomach cancer, particularly if they contain chemicals called nitrites. Food additives and contaminants are claimed to be responsible for 1% of cancer deaths.[26]

Poor nutrition and obesity in adults are risk factors linked to 30% of cancer deaths, in addition to increased risk of diseases such as diabetes and cardiovascular disease.[27] Women who are 35% above ideal body weight have a 55% greater risk of developing cancer of the gallbladder, breast, cervix, endometrium, uterus or ovary. Men who are 35% above ideal body weight have a 40% greater chance of developing colon and prostate cancer.[28]

The national "five to ten a day" campaign promotes vegetable and fruit consumption. The website (http://www.5to10aday.com/) includes a large database with recipe suggestions for a wide variety of fruits and vegetables.

Health Canada's web site (http://www.hc-sc.gc.ca/english/lifestyles/food_nutr.html) provides a wealth of information on food and nutrition, including Canada's Food Guide to Healthy Eating.

[e] Based on a model using 1999 smoking prevalence rates and cancer incident rates from 1988-1997 in five NWT community groups.

[f] Canadian Community Health Survey 2000-01, Share File. "Not stated" responses were removed from the denominator with the assumption that those who responded were similar to those who did not.

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- In 2000-2001, more than half (57%) of the population in the NWT aged 20 to 64 years (excluding pregnant females) was overweight or obese with a BMI≥25 (62% males, 52% females). In comparison, 48% of the Canadian population was overweight or obese (56% males, 40% females).[g] These statistics have clear implications for the NWT population with regards to cancer risk.

Practical information is useful when educating people on how to incorporate fruits and vegetables into meals. Cooking classes and one-on-one or group nutrition sessions are available to families in communities to improve nutrition. Other community-based initiatives that promote healthy eating include gardening, school breakfast programs, grocery store tours, and 'no junk food' contests.

Alcohol use accounts for 3% of cancer deaths.[29] It primarily plays a role in liver cancer due to cirrhosis (liver disease), and is possibly linked to colon, breast, larynx and esophageal cancer. Similar to the tobacco strategy, interventions preventing alcohol misuse could include policies that regulate availability and restrict sales (especially to minors), higher prices and taxation, healthcare provider counselling, denormalization, counter advertising and warning labels, community mobilization and server training.

Physical Activity

Physical activity is necessary to achieve and maintain a healthy body weight. Research shows a convincing link between increased physical activity and a reduced risk of colon cancer.[30,31] There is also evidence to support a probable reduction in the risk of breast cancer in women and prostate cancer in men. Based on current evidence, a sedentary lifestyle may account for 5% of all cancer deaths.[32]

- In 2000-2001, 55% of NWT residents aged 12 years and older were considered inactive. This is consistent with the national average of 53%.[h] This lack of physical activity presents a public health concern in the NWT.

The GNWT is developing an Active Living Strategy, which promotes active living among Northern residents. This interdepartmental initiative considers various policies, such as mandatory school-based physical fitness, nutrition education programs and parental supports, as ways to improve physical activity and nutrition.

Sun Exposure

Repeated exposure to ultraviolet (UV) radiation from the sun is the leading cause of skin cancer and accounts for 1% of cancer deaths. Although sun exposure will only cause sunburn in the short term, UV exposure over time causes premature aging of the skin, skin cancer, cataracts, and other forms of eye damage. It is estimated that 90% of all skin cancers could be prevented.[33] Using sunscreens, avoiding prolonged exposure to the sun and wearing protective clothing can reduce the risk. Between 1992 and 2000, there were 23 cases of malignant melanoma diagnosed in the NWT.

Parents provide an environment that can significantly influence a child's desire to participate in organized athletic activities, and their support may be paramount in encouraging participation during a child's formative and adolescent years.

Martin S, Jackson A., Richardson P. and Weiller K. 1999. Coaching Preferences of Adolescent Youths and Their Parents. Journal of Applies Sports Psychology, 11:247-262

The National Survey on Sun Exposure and Protective Behaviours found that most Canadians practise insufficient sun protection and that awareness of the need to practise sun protection is not high.

Luvato C., Shoveller J., Rivers, J. (Eds.). National Survey on Sun Exposure and Protective Behaviours: Final Report. Vancouver: Institute of Health Promotion Research, UBC, 1998

[g] Canadian Community Health Survey 2000-01, Share File. "Not stated" responses were removed from the denominator with the assumption that those who responded were similar to those who did not.
[h] Ibid.

Additional Risk Factors

Exposure to occupational carcinogens (cancer-causing agents) may also be associated with an increased risk of cancer and accounts for up to 5% of cancer deaths.[34] To minimize the risk for cancer, regulations in the workplace (e.g. wearing protective equipment, biological monitoring of workers, replacing carcinogens with other materials and processes) are created and education on chemical hazards is provided. Exposure to environmental tobacco smoke in the workplace has also been documented as presenting significant hazards to certain categories of workers.

The role of environmental contaminants in relation to cancer is a highly debated topic. This is because studies in this area are often complicated due to difficulties in measuring contaminant exposure. In addition, such studies often require large populations and a long-term follow-up. The overall contribution of environmental carcinogens to the current burden of cancer is perhaps 3% or less.[35] Regulations that prevent the introduction of carcinogens into the environment are the most effective strategy. However, this approach must also be supported by education.

Radon is a radioactive gas released from uranium substances. Trace amounts exist naturally from ground sources. It can migrate out of soil and rock into the surrounding air and accumulate in poorly ventilated or closed areas such as basements. Residential exposure to radon can cause lung cancer, particularly at very high levels. Approximately 12 to 14% of lung cancers may be attributable to exposure to radon in the residential setting.[36] In certain occupational settings, especially uranium mining, the risk for lung cancer is even higher. There are ways for homeowners to reduce radon concentrations in their homes such as renovating existing basement floors, particularly earth floors, sealing cracks and openings and ventilating sub-flooring of basement floors. There are also devices sold in the market to measure radon levels in the home.

The Northern Contaminants Program conducted several studies to evaluate and communicate the benefit of traditional/country foods and the risks from contaminants.[37] Even though contaminants are sometimes present in fish and wildlife at levels of concern, the benefits of harvesting, preparing and consuming traditional/country foods far outweigh the potential health risks. In addition, most evidence associating contaminants with particular health conditions remains speculative and requires continued research. This is because several factors in addition to contaminants also contribute to poor health (e.g. lifestyle, diet, social and economic conditions, and genetics). Furthermore, scientists find that traditional/country foods have remarkable nutritional value, which can help fight illness, injury and disease better than the popular market food. Whereas popular market food is often associated with health problems such as diabetes, obesity and heart disease and healthy market food is expensive for Aboriginal northerners, the traditional diet conveys nutritional, social, cultural, spiritual, and economic benefits.

Some evidence links environmental tobacco smoke, pesticides, radon, and chlorinated disinfection by-products in drinking water to human cancers. While the overall risk for exposure to carcinogens has been estimated at about 3-9 %,[9] there has been little surveillance and relatively few strong research studies into the role of environmental contaminants in human cancer.

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Some evidence links environmental tobacco smoke, pesticides, radon and chlorinated disinfection by-products in drinking water to human cancers. While the overall risk for exposure to carcinogens has been estimated at about 3-4%,[29] there has been little surveillance and relatively few strong research studies into the role of environmental contaminants in human cancer.

Viruses and other biologic agents are also associated with certain types of cancer and 5% of cancer deaths.[39]

- Chronic hepatitis B virus accounts for 40 to 60% of liver cancer and hepatitis C virus accounts for 20 to 30%.[39] The NWT's immunization program against hepatitis B should decrease the rate of this type of cancer. In addition, lifestyle changes, particularly safer sex and avoidance of needle sharing, can prevent infection from hepatitis C.
- The human papilloma virus (a sexually transmitted disease), early age at first intercourse and multiple sex partners are strongly associated with 90% of cervical cancers.[40] Screening for early signs of cervical cancer using the Pap test and safer sex practices can successfully reduce the incidence of this disease.
- Infection with the bacterium *H.pylori* is the probable cause of many stomach cancers. However, there is still debate as to whether *H.pylori* can be effectively eradicated through drug therapy and to what extent a program of screening and treatment could be a means of prevention.[41]

Some therapeutic drugs can affect cancer risk. For example, oral contraceptives appear to cause a very small increase in the risk for breast cancer, but reduce the risks of ovarian and uterine cancers. Some evidence suggest that combined estrogen/progesterone hormone replacement therapy given to post-menopausal women increases the risk of breast, but may reduce the risk of colorectal cancer. Furthermore, estrogen given alone increases the risk of cancer of the uterus.[42]

Table 16 shows the proportion of cancer deaths in a population that can be attributed to a risk factor. Also known as the population attributable risk, this table can also be explained as the proportional decrease in the mortality of a disease if the entire population were no longer exposed to the suspected cause.

Table 16
Causes of Cancer Deaths

Risk Factors	Percent (%)
Tobacco	30
Diet/Obesity	30
Sedentary Lifestyle	5
Occupational Factors	5
Family History of Cancer	5
Viruses/Other Biological Agents	5
Prenatal Factors/Growth	5
Reproductive Factors	3
Alcohol	3
Socio-economic Status	3
Environmental Pollution	2
Ionizing/Ultraviolet Radiation	2
Prescription Drugs/Medical Procedures	1
Salt/Food Additives/Contaminants	1

Source: Cancer Causes and Control, Volume 7, November 1996

Table 17 is a comprehensive list of activities carried out in the NWT for the primary prevention of cancer.

Table 17
NWT Activities for the Primary Prevention of Cancer

NWT Intervention Strategies	Activities On-Going or Planned in the NWT
Tobacco	
Health Promotion Strategy (see Action on Tobacco)	• Education (including mass media, school-based programs and health professional training), in partnership with federal, territorial and other NGO funding (e.g. mass media campaign, BLAST, etc.) • High prices, based on high taxation • Restricting access and sales to minors (via enforcement) • Restrictions on smoking in public places and in the workplace (legislation pending) • Restrictions on advertising and promotion of tobacco • Support for smoking cessation, including the NWT Territorial Quit and Win Contest • Community-based funding for tobacco prevention projects
Diet, Overweight and Physical Activity	
Health Promotion Strategy (see Active Living Strategy)	• Education, in partnership with national, territorial and regional partners • Distribution of new Health Canada food labelling information • Food Mail Program (federal subsidy) • Community-based funding for active living and healthy eating projects • Working with the Departments of Municipal and Community Affairs and Education, Culture and Employment as well as key stakeholders to develop a territorial active living strategy • Active Living promotional activities, including Recreation and Fitweek, Education week "Choose to Move... Move for Health", and Parks and Recreation directory
Infections (hepatitis B and C, human papilloma virus)	
Health Protection	• Cervical cancer screening programs (human papilloma virus) • Immunization program (hepatitis B)
Environmental Contaminants	
Health Protection and Environmental Protection Services (Resource, Wildlife and Economic Development – RWED)	• Northern Contaminants Program (Indian and Northern Affairs Canada) • Air (RWED) and water (Health and Social Services) quality testing • Hazardous Substance Program and Waste Management Program (RWED)

Table adapted from Primary Prevention of Cancer: Background paper, February 2003, Schabas R., www.cancercontrol.org

There is mounting evidence that a threshold of 100 mSv or more may exist for radiation-induced cancer. The issue is of significance to northerners, who were exposed in the past to nuclear weapons fallout or who have slightly higher exposures due to caribou meat consumption. Even if one assumes that the linear no-threshold hypothesis is correct, the risk of continued consumption of caribou meat is very small. A maximum radiation dose rate at present is estimated to be about three to four mSv/year. By restricting caribou meat consumption, northerners would deny the nutritional, social and cultural benefits of this important traditional/ country food.

Northern Contaminants Program, Indian and Northern Affairs Canada

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There is mounting evidence that a threshold of 100 mSv or more may exist for radiation-induced cancer. The issue is of significance to northerners, who were exposed in the past to nuclear weapons fallout or who have slightly higher exposures due to caribou meat consumption. Even if one assumes that the linear no-threshold hypothesis is correct, the risk of continued consumption of caribou meat is very small. A maximum radiation dose rate at present is estimated to be about three to four mSv/year. By restricting caribou meat consumption, northerners would deny the nutritional, social and cultural benefits of this important traditional/ country food.

Northern Contaminants Program, Indian and Northern Affairs Canada

Criteria for Cancer Screening

- *The target cancer should be appropriate for screening.*
- *The objectives of screening must be clearly identified.*
- *There should be an appropriate screening test.*
- *There should be agreement on the appropriate management of people with positive results on the screening test.*
- *There must be sound evidence that screening impacts favourably on its intended objectives. This evidence must deal effectively with critical potential biases, including length, lead-time, over diagnosis, and selection bias. Randomized clinical trial (RCT) evidence should be the required standard, wherever possible, for new screening strategies.*
- *Screening should do more good than harm.*
- *The health care system should be capable of supporting all necessary elements of screening, including diagnosis and treatment.*
- *Screening should be endorsed only if it is provided in a continuous manner in conjunction with the necessary quality assurance and programmatic elements.*

Canadian Strategy for Cancer Control

Early Detection

The early detection of disease when treatment may be more effective is known as secondary prevention. Survival generally improves with early detection and treatment of cancer. Screening tests for those who do not have symptoms is one of several strategies to control cancer, however, only certain types of cancer are suitable for screening tests. For example, some cancers spread early and rapidly before they can be detected. In these cases, screening would not necessarily improve survival. Second, the screening test should be highly sensitive and specific so as to minimize false positive and false negative results. Such tests must also be acceptable to the population at risk. There must be adequate numbers of people being screened (especially if the disease is not very prevalent in the population) for the screening test to detect at least one cancer. Without high participation from the target population, the screening program becomes less cost-effective. Testing certain age groups or cohorts with behavioural characteristics (e.g. sexual activity) not only improves chances for detection but also minimizes the potential harm (e.g. unnecessary anxiety and risks from further investigations) due to false positive results.

A population cancer-screening program should do more good than harm at both an individual and population level. A well-organized program with good recruitment of persons at risk, quality control, follow-up of positive tests, and a recall plan for those who require regular screening are all necessary to ensure a successful program. (Refer to sidebar for the list of criteria for a screening program.)

In the NWT, there are routine screening programs in place for breast and cervical cancer. Screening for prostate cancer is not conducted on a routine basis due to insufficient evidence for its effectiveness. A colorectal cancer-screening program is currently being considered for implementation in the NWT.

Breast Cancer Screening

From 1986 to 1998, the gap between the incidence and mortality rate for NWT breast cancer widened.[43] This means that more breast cancers are being detected, most likely due to a combination of factors including increased screening efforts, changes in diet or reproductive patterns, increased rates of smoking in women, and an aging population. In the meantime, the mortality rates are decreasing, signifying improvements in breast cancer survival due to early detection and more effective treatments.

Apart from improved treatment methods, the three-pronged approach to breast health – breast self-examination, clinical breast examination, and mammography – is the best way to reduce deaths from breast cancer. While mammography is well recognized as key to detection of cancer, equally

important are the education of women to perform adequate breast self-examinations and training of health professionals to use appropriate standards and guidelines for clinical breast examinations.

Studies indicate that screening women aged 50 to 69 once every two years can decrease cancer mortality by 25%.[44] There is still debate concerning the true benefit of screening women between 40 and 49 years of age. There are those who claim that studies which show a lack of benefit were poorly designed and that with new screening tools, more experienced screeners and improved treatment, better outcomes should be expected. Others suggest that routine screening in pre-menopausal women has lesser impact on survival and only increases the amount of time a woman knows that she has cancer. This is known as lead-time bias. Breast cancer in pre-menopausal women tends to be more aggressive and spreads faster, even before mammography has a chance to detect it. In addition, lower prevalence rates of breast cancer in pre-menopausal women leads to an increase in false positive results, which can also be physically and psychologically harmful for those who must undergo unnecessary follow-up medical procedures. Currently, women younger than 50 years of age are screened on the recommendation of their physician or through self-referral based on their personal assessment of risk factors and perceived benefits.

Despite evidence about the effectiveness of mammography in reducing breast cancer deaths, not all eligible women are screened in NWT. In the smaller communities, most women must coincide a regular mammogram appointment with other planned trips to Yellowknife or Inuvik (where mammography services are located). In 2000-2001, only 54% of NWT women aged 50 to 69 years had a mammogram within the last two years, compared to 70% of eligible Canadian women.[1] Currently, a pilot project has been undertaken by Stanton Territorial Health Authority to create a better coordinated program for breast cancer screening in the NWT.

NWT Guidelines for Breast Cancer Screening in the General Population

- Monthly breast self-examination is recommended at the beginning of adolescence, following first menstruation.
- Annual clinical breast examination by a trained professional is recommended for women in their mid-20s and older.
- Mammography is recommended every two years for all NWT women aged 50 and older.

During their lifetime, one in nine Canadian women will develop breast cancer. One in 27 will die from it.

National Cancer Institute of Canada, Canadian Cancer Statistics, Toronto, Canada, 2002

Risk factors for breast cancer include being a woman, increasing age, family history (mother, sister, daughter), mutations of the BRCA1 and BRCA2 genes, past history of breast cancer or previous breast biopsy, early menstruation (before age 12), women who have had no children or their first child after age 30, and use of alcohol (over two to five drinks a day).

American Cancer Society

[1] Canadian Community Health Survey 2000-01, Share File. "Not stated" responses were removed from the denominator with the assumption that those who responded were similar to those who did not.

Criteria for Cancer Screening

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Breast Cancer Society

NWT Guidelines for Breast Cancer Screening in the General Population

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- Annual clinical breast examination by a trained professional is recommended for women in their mid-20s and older.
- Mammography is recommended every two years for all NWT women aged 50 and older.

The overwhelming majority of women today with a diagnosis of cervical cancer have either not had regular Pap tests or they have not even followed up after detection of an abnormal smear. Not undergoing regular Pap tests is the single greatest risk factor for a poor outcome in women who develop cervical cancer.

Cervical Cancer Screening in Canada: 1998 Surveillance Report, Health Canada

Cervical cancer is now the 12th most commonly diagnosed cancer among women of all ages in Canada, however, it ranks third among women aged 20 to 34 and women age 35 to 49. Since the introduction of the Pap test in Canada, the rate of mortality from cervical cancer has steadily declined, with an almost 50% drop over the past 25 years. The incidence of invasive cervical cancer has also fallen considerably. Overall, close to 1,000 deaths due to cervical cancer have been prevented each year as a result of improved control measures.

Cervical Cancer Screening in Canada: 1998 Surveillance Report, Health Canada

Cervical Cancer Screening

The Pap smear test is an effective tool in reducing 60% of cases and deaths from cervical cancer.[45] It is considered primary and secondary prevention since it can detect premalignant lesions in addition to early cancer. The spread of cervical cancer is largely preventable through screening and early treatment, but there are still some women in the NWT who have never had a Pap test or are not regularly tested. In 2000-2001, 79% of NWT women, versus 71% of Canadian women, aged 18 and older had received a Pap smear within the last three years.[1] The limitation of using data from the Canadian Community Health Survey is that sexually active women younger than 18 years were not asked whether they had a Pap smear within the last three years.

In a separate study that examined data from Pap smear tests collected from 1997 to 2000, the screening rate for eligible NWT women (defined as 15 years of age and older) was 82%.[46] During this period, 90% of Non-Aboriginal women in this age group were screened, whereas Aboriginal women were screened at a significantly lower rate (73%). In addition, the proportion of women who were screened decreased with age. It is possible that women after their childbearing years are not aware that they may need to continue screening until 69 years of age.

An organized screening program with high coverage and participation, adequate follow-up of positive tests, and a recall plan to ensure regular testing, is required to achieve successful secondary prevention. In the smaller communities, an organized system for recall is usually in place through the health centre to remind women of the need for regular screening. This may explain the equivalent screening rates for Non-Aboriginal and Aboriginal women in the smaller communities. However, in Yellowknife and the regional centres, women are screened primarily through patient-initiated visits to the physician. In this case, a statistical difference exists in the screening rates between Non-Aboriginal and Aboriginal women (89% vs. 70%).

Overall, the screening rates within regional centres (75%) and small communities (72%) are significantly lower than rates in Yellowknife (87%).[47] It is possible these differences are a result of varying accessibility to healthcare and health service providers. In addition, the average level of education and socio-economic status of women living in the smaller communities is lower than that of women in Yellowknife, which can contribute to differences in awareness about cervical cancer screening.

[1] Canadian Community Health Survey 2000-01, Share File. "Not stated" responses were removed from the denominator with the assumption that those who responded were similar to those who did not.

NWT Guidelines for Cervical Cancer Screening in the General Population

- Annual screening is recommended following initiation of sexual activity.
- After three normal tests, the Pap smear is done every two years to age 69.
- At the age of 70, the test is discontinued if there is no history of abnormal results or once two consecutive normal tests follow a previous abnormal result.

Colorectal Cancer Screening

Colorectal cancer is the most frequently diagnosed cancer in the NWT and is the second most common cause of cancer death after lung cancer. Currently there is no official NWT guideline for colorectal cancer screening in the NWT. However, due to the prevalent nature of this disease, the feasibility of implementing a targeted screening program is under study. Similar to cervical cancer screening, a colorectal cancer screening program combines elements of both primary and secondary prevention.

The National Committee on Colorectal Cancer Screening[48] and the Canadian Cancer Society[49] recently endorsed colorectal screening using fecal occult blood testing.* Strong evidence indicates the method of screening reduces colorectal cancer mortality by 15 to 33% in a targeted population of 50 to 74 year old people.[50,51] Colonoscopy and flexible sigmoidscopy are also options for screening.† Although the latter screening options are more effective in detecting colorectal cancer, the average person without symptoms may be less prepared to accept the discomfort, risks and inconvenience of the procedure. Once again, an adequate number of people screened within the target group is necessary for any screening test to have an impact on population health outcomes. Although fecal occult blood testing and colonoscopy are cost-effective screening interventions,[52] certain issues must still be addressed such as how the healthcare system will cope with an influx of screening tests performed each year without further delaying tests for those already at high-risk. This is especially true for colonoscopies, which require highly trained personnel and technical equipment.

Colorectal cancer is the third most common cancer in Canada and affects both men and women. Regular screening can diagnose the disease at an early stage when it is more treatable, therefore reducing mortality.

Health Canada

Risk factors for colorectal cancer include being 50 or older, having polyps (small growth on the inner wall of the colon and rectum), obesity, physical inactivity, diabetes, heavy alcohol consumption, and living with ulcerative colitis.

Canadian Cancer Society

Cancer Treatment

Treatment plans for cancer patients depend on the type of cancer, the size and location of the tumour, and to what extent the cancer has spread to other parts of the body. Issues such as overall health and personal preferences for treatment are also considered. Treatment can include surgery, radiation therapy, chemotherapy, immunotherapy or hormone therapy. Sometimes a treatment plan will involve a combination of these therapies.

* A fecal occult blood test looks for blood in the feces.

† In a colonoscopy or sigmoidoscopy, the doctor uses a scope to view inside the colon or rectum and takes a tissue sample.

The overwhelming majority of women today with a diagnosis of cervical cancer have either not had regular Pap tests or they have not even followed up after detection of an abnormal smear. Not undergoing regular Pap tests is the single greatest risk factor for a poor outcome in women who develop cervical cancer.

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Certain treatments are provided at the Stanton Territorial Hospital in Yellowknife while others are only offered by more specialized facilities outside of the NWT. The majority of NWT patients are referred to the Cross Cancer Institute in Edmonton, Alberta. However, the location of treatment is decided on a case-by-case basis (taking into consideration space, equipment, staff capacity, skill level and what is deemed best for the patient). Most of the cancer care coordination is carried out by nurses in clinics and health centres, under the direction of primary care physicians.

One aspect of living in the North is the limited ability for cancer patients to participate in clinical trials. Many of the studies that test new drugs and/or procedures are conducted in other jurisdictions. Often researchers will approach patients whom they feel can be monitored closely for a certain period of time. This does not signify that NWT patients could not participate in trials; they are just not offered the choice in most cases.

Surgery

Surgery involves the removal of part or the entire tumour and some surrounding tissue. The decision to have surgery depends on the location of the tumour and its proximity to vital organs. Some diagnostic procedures or surgeries are performed at Stanton Territorial Hospital while others are conducted outside the territory.

Radiation

Radiation treatment uses high levels of X-rays or other forms of radiation directed at the tumour. This procedure essentially burns the cells so that they are unable to grow and spread. Nearby normal cells are also affected, thus causing side effects such as fatigue, diarrhea, nausea and soreness at the radiation site. Diet and medication can control some of these side effects. Radiation therapy is only provided out-of-territory.

Many years ago doctors learned how to use this (radiation) energy to "see" inside the body and find disease. You've probably seen a chest X-ray or X-ray pictures of your teeth or your bones. At high doses (many times those used for X-ray exams) radiation is used to treat cancer and other illnesses.

National Cancer Institute of Canada

Chemotherapy

Chemotherapy may be provided as part of a cancer treatment and/or when there are concerns that cancer has become widespread. The drug treatment, which is administered orally or by injection, interferes with the growth of cancer cells. Healthy cells can also be affected during treatment. Side effects of treatment can include nausea, vomiting, loss of appetite, fatigue, hair loss. Increased risk of infection may also arise but can usually be reduced or controlled.

Another treatment called immunotherapy uses special proteins or substances to boost the immune system's ability to fight the cancer, especially after chemotherapy.

Prior to undergoing chemotherapy in the NWT, a patient generally visits the oncologist at the Cross Cancer Institute in Edmonton. Following a discussion on treatment options, the patient returns to the NWT with a chemotherapy treatment plan. The nurses in the medical Daycare Unit at the Stanton Territorial Hospital coordinate the administration of chemotherapy. In between scheduled treatments at the hospital, the patient can return to his/her community to recuperate. Depending on the frequency of and the delay between chemotherapy treatments, traveling from the community to Yellowknife can be tiring for the patient.

Hormone Therapy

For cancers that are sensitive to changes in hormone levels, hormonal therapy may be an option. Adding, removing or regulating the activity of a hormone within the body can affect the growth or activity of cancer cells. Currently, Stanton Territorial Hospital has the capacity to perform certain types of hormone therapy, specifically for breast cancer.

Alternative Therapy

Alternative therapies encompass a broad range of healing philosophies and approaches. Although people will attest to the benefit of these therapies, their safety and effectiveness have yet to be tested by scientific methods. Consulting with a physician prior to taking any alternative treatments is important. This is because the alternative approach may interfere with other drug treatments or tests.

Traditional Healing Options

Traditional healing methods are beneficial in palliative care, pain management and addressing the patient's spiritual and emotional needs.[53] When seeking a traditional healer, it is important to ask about the appropriate protocol needed to approach the healer (cloths/blankets/tobacco/berries/food) and follow the treatment protocol as described. It is also necessary to consult with the treating physician to verify whether the remedies from both therapies are compatible.

Continuing Care/Cancer Support

The needs of the patient – physical, social, emotional, nutritional, informational, psychological, spiritual, and practical – should be addressed throughout the patient's care.[54,55] Research findings indicate a relationship between psychosocial interventions and improved quality of life, cost savings and possibly increased survival.[56,57,58,59] Treatment extends beyond the hospital and includes care in the community or at home. In order to do so, a coordinated approach is needed to provide access to a full range of services in all communities and ensure seamless delivery between the community and hospital.

For the Aboriginal people, the concept of wholeness and balance is fundamental and incorporates an essential belief that the physical, mental, spiritual, and emotional aspects of life are connected and cannot be separated.

Aboriginal Cancer Care Unit. Analysis of the Findings from Aboriginal Cancer Care Needs Assessment: "It's Our Responsibility"... Cancer Care Ontario, 2002

Across Canada there has been a shift in the focus of cancer care from tertiary care centres back into the community. Consequently, the patient's family and community now share a higher burden of cancer care.

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Radiation treatment uses high-powered X-rays or other forms of radiation directed at the tumour. This repeatedly, eventually burns the cells so that they are unable to grow and spread. Nearby normal cells are also affected, thus causing side effects (e.g. fatigue, diarrhea, nausea and soreness of the inhalation site). Short-term reactions are usually mild. Most of these side effects disappear shortly after radiation therapy is completed (Canadian Cancer Society).

Chemotherapy

Chemotherapy may be prescribed as part of a cancer treatment and/or when cancer is present that cannot be removed by surgery or treated with radiation. These are powerful drugs that are usually given intravenously (by injection) or by mouth to stop the growth of cancer cells, usually cells that grow quickly. Unfortunately, some healthy cells can also be affected during treatment. Side effects of treatment can include nausea, vomiting, loss of appetite, fatigue, hair loss, increased risk of infection (low white blood cell count), and bruising or bleeding (low platelet count). These side effects usually go away after treatment is finished.

Another treatment option is hormone therapy. Some cancers require hormones to grow. So-called "hormone sensitive" cancers, such as breast, prostate or ovarian cancer, can sometimes be controlled by blocking the hormones that they require to grow. Hormone therapy is usually given after surgery or chemotherapy.

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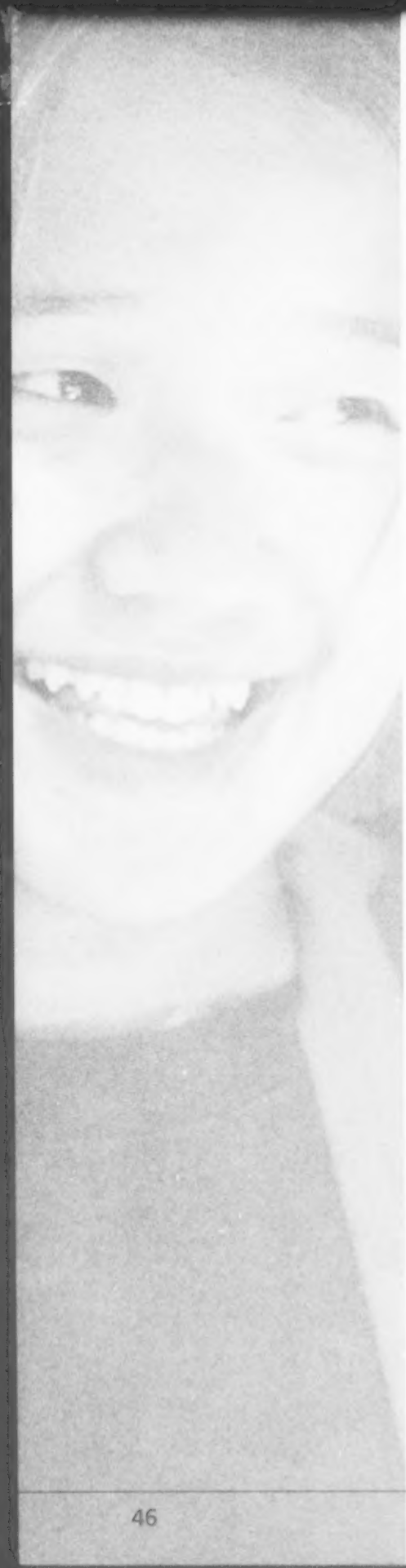

Palliative Care

Palliative care involves caring for patients who have a terminal illness. It addresses the management of pain and other symptoms, as well as psychological, social and spiritual needs. The goal is to achieve the best quality of life for patients and their families. There are a limited number of palliative care beds available at Stanton Territorial Hospital and long-term care facilities. Most individuals, however, will choose to die at home with the assistance of home care resources.

Home or Community Care

Home care provides services, both short and long term, to incapacitated individuals. The services are intended to maximize the client's health and/or social well-being and allow the person to remain at home and in the community. If home nursing is required in a community that does not have home care programs or has limited services, provisions are made to transfer the client to the closest community so that he/she can receive these essential services.

Home care services may include case management, home nursing, community mental health nursing, personal care, assistance with activities of daily living, in-home respite care, nutrition, palliative care, rehabilitation, social work, teaching and family support, meals on wheels, equipment loan coordination, and foot care. The program is available to those whose needs are assessed by home care personnel.

Telehealth

Using state-of-the-art telecommunications and telehealth technologies, people living with cancer in remote locations are able to consult with their physician or specialist on a more regular basis, and minimize the time and cost associated with traveling. Telehealth can improve the quality of patient care and health education by improving the timeliness of diagnostic, investigative and management decisions, and increasing access to specialist/professional opinions. Furthermore, it permits the patient to receive information within his/her community amidst a support network of family and friends.

Services are currently available in the following communities: Yellowknife, Fort Smith, Inuvik, Holman, Fort Simpson, Hay River, Deline, Lutselk'e and Fort Resolution.

In the NWT, telehealth currently has a limited role in cancer-related services. The most frequent use of telehealth is made for skin cancer cases. The capacity of telehealth towards the diagnostics and care for other cancer types is yet to be fully realized.

Support Services

Supportive care for cancer patients is important for coping with the side effects of treatment as well as the social, psychological, emotional and spiritual matters (e.g. counselling programs to deal with grieving, anxiety, depression, and stress), and practical concerns (e.g. help at home and transportation to treatment).

A cancer care coordinator can ensure the patient and family are well informed of available cancer support services, and assist toward sustaining a seamless and integrated delivery of care. Currently, there is no cancer care coordinator in the NWT.

The Canadian Cancer Society is a national, community-based organization of volunteers whose mission is the eradication of cancer and the enhancement of the quality of life of people living with cancer.[60] Peer support programs are organized by the Canadian Cancer Society to put cancer patients and their families in touch with cancer survivors. Volunteers are trained to listen, provide emotional support and share practical insights about living with cancer. Support is available in person or by telephone. A Cancer Information Service is also available in English or French (1-888-939-3333) or Aboriginal languages (1-888-261-4673).

Extended Health Benefits

All permanent residents of the NWT are eligible for coverage under the NWT Health Care Plan. Benefits include hospital inpatient/outpatient services, physician services and out of territory/country coverage for medically necessary services.

An individual diagnosed with cancer can apply for Extended Health Benefits from the Department of Health and Social Services if he/she is:

- registered with a NWT Health Care Plan;
- a permanent resident in the NWT; and
- Non-Aboriginal or Métis.

These extended benefits cover the cost and dispensing fee for medications listed in the NWT drug schedule; surgical appliances, supplies and prosthetics; and medical transportation if referred away from the home community for treatment.

Medical Travel Benefits

Medical travel benefits will only be provided up to the closest place where the necessary service is available. In addition, the travel must originate from within the NWT. The benefit provides for return airfare, ambulance services on emergency medical evacuations, and limited support for meals, accommodation and ground transportation.

These benefits can be extended to a medical or non-medical escort who is authorized to accompany a patient. A non-medical escort will be authorized when:

- the patient is under the age of 19 and requires an escort;
- the patient is an infant who is being breast fed by the mother who is the non-medical escort;
- the patient has a mental or physical handicap of a nature that he or she is not able to travel unassisted;
- the patient requires an escort for interpretation during the travel; or
- the attending physician at the treatment facility provides a written request for a non-medical escort to participate in a treatment program in order to learn how to care for the patient following discharge.

Service Delivery Challenges

Living in the North can bring about some challenges, especially with regards to the accessibility of cancer services. People living both within urban and remote communities must often travel significant distances to visit medical personnel for diagnosis and treatment. This can be a frightening experience, especially for individuals who have never traveled to a major urban centre. They must leave their support network, often to undergo tests or treatment, to make difficult decisions or to face distressing news. In addition, access to cancer education and awareness programs is limited in the NWT and not necessarily culturally or language specific.

In many communities, the staff are burdened with a broad range of duties and may sometimes lack the capacity to provide cancer care services such as cancer prevention education or palliative care. Such issues can be exacerbated with high staff turnover. These challenges speak to the need for a more organized approach to the management of cancer screening, treatment and follow-up programs in the NWT, including provider as well as patient/family support and education.

In 2001, the Aboriginal Cancer Care Unit (ACCU) of Cancer Care Ontario (CCO) committed to conducting a province-wide analysis of cancer issues in the Aboriginal pouplation... The purpose of the needs assessment was to explore the Aboringinal people's attitudes and experiences with cancer services in order to establish an evidence-based rationale for the development of an Aboriginal Cancer Strategy.

Aboriginal Cancer Care Unit. Analysis of the Findings from Aboriginal Cancer Care Needs Assessment: "It's Our Responsibility"... Cancer Care Ontario, 2002

Developing an NWT Action Plan for Cancer Control

National Strategy for Cancer Control

The Canadian Strategy for Cancer Control is a national strategy whose vision is to optimize the use of current knowledge and available resources for cancer control. Its objective is to control cancer in the population though "more collaborative planning, priority setting, and public policy development and implementation." The goals of the national strategy include:[51]

- reduced incidence of cancer, mortality, and morbidity;
- increased quality of life for those living with, or recovering from, cancer;
- equitable access to evidence-based cancer control interventions;
- improved integration of cancer healthcare, from primary to palliative care;
- rebalanced investments that sustain effective prevention, psychosocial/ supportive and palliative care;
- empowered patients; and
- harmonization with provincial, territorial and federal health plans.

In some cases, actions that primarily address one goal can lead to the achievement of other goals. For example, early detection through a cancer-screening program can reduce cancer mortality, increase the quality of life for those living with cancer, and empower patients.

An NWT strategy could use the goals and recommendations of the national strategy as a guide yet remain specific enough to respond to the unique needs, challenges and resources of the NWT.

Cancer vs. Chronic Disease Strategy

Prior to developing an NWT action plan, discussions are needed to evaluate whether a cancer-specific strategy or a chronic disease strategy with a cancer component would be most appropriate for the NWT. In a report that reviewed cancer prevention vs. a chronic disease prevention strategy, both benefits and disadvantages were denoted.[52] A chronic disease strategy has the advantage of consolidating efforts and resources in support of a common group of targets. For instance, there are targets shared between cancer prevention and the prevention of other chronic diseases, such as cardiovascular disease, stroke and diabetes (tobacco, diet, physical activity, obesity), and lung disease (tobacco). A chronic disease strategy would assist in providing a consistent message to policy makers, health professionals and the public. However, the disadvantages include the loss of cancer-specificity in the message; the danger of focussing only on issues that are common to the chronic diseases; and the loss of flexibility and of making decisions relatively quickly because of the involvement of multiple stakeholders.

Effective cancer control requires a concerted and shared effort on the part of health agencies, government, researchers, the medical community, and the public.

Alberta Cancer Board

Developing an NWT Action Plan for Cancer Control

Developing Sustainable Partnerships

Establishing effective cancer control requires the collaboration of numerous stakeholders so as to ensure a full range of programs and services by removing gaps and duplication, increasing integration and improving coordination of services. Table 18 lists ways that various stakeholders have taken part in, or can approach, cancer control.

Table 18
Stakeholders and Approaches to Cancer Control

Stakeholder	Approaches to Cancer Control
Federal, Territorial, Local and Aboriginal Governments	• Surveillance of cancer in the population (NWT Cancer Registry) • Enact and enforce legislation to support cancer prevention (e.g. establishing non-smoking bylaws, banning tobacco advertising and promotion, providing tax incentives to improve access to nutritious foods and/or improving food labelling requirements) • Make high-quality, organized cancer screening accessible to all who can benefit • Invest in the recruitment and retention of health and social service personnel • Ensure the integration and coordination of cancer healthcare, from primary to palliative care • Ensure access to high-quality, evidence-based cancer treatment • Establish a framework with relevant stakeholders for delivering cancer prevention services and cancer care to the population
Municipal Governments and Band Councils	• Provide necessary supports for healthier lifestyle choices (e.g. the development and enforcement of smoking bylaws; the construction of bicycle lanes, walking trails, or parks; the protection of the local environment; the monitoring and control of carcinogenic chemicals)
Non-governmental Organizations	• Deliver programs and disseminate information, materials and training to community groups working towards cancer prevention and control
Health and Social Services Authorities	• Provide education sessions to communities for raising awareness on cancer • Establish community partnerships and mobilize community coalitions to build support for healthier lifestyle choices, cancer screening and increased quality of life for those living with, or recovering from, cancer • Invest in proven strategies or pilot projects that can reduce the burden of cancer • Provide high-quality, evidence-based care for a client/family dealing with cancer

Table 18 continued
Stakeholders and Approaches to Cancer Control

Stakeholder	Approaches to Cancer Control
Health Professionals	• Build cancer prevention best practices into everyday clinical activities • Provide regular cancer screening to individuals that can benefit • Coordinate and provide high-quality, evidence-based patient care
Community/Local Groups	• Advocate for community/municipal policies that prevent cancer and/or provide care to those with cancer • Support the psychosocial well-being of individuals with cancer and their families
Private Sector	• Promote positive role-modeling behaviour, support anti-tobacco legislation and anti-tobacco media policies, lower costs for nutritious food, sponsor sporting events and provide resources to conduct research on cancer in the North
Individuals and Families	• Stop or do not start smoking, make healthier food choices, incorporate active living into daily life, practice safe sex, and visit the physician on a regular basis for applicable screening tests

Cancer Control within an Integrated Service Delivery Model

Within an Integrated Service Delivery Model,[63] NWT residents should have access to a broad range of health services and social programs funded through the Department, and delivered for the most part by Health and Social Services (HSS) Authorities. These services and programs must be integrated horizontally and vertically from the level of primary community care through to secondary (regional) and tertiary (territorial) level services.

Primary community care refers to health and social services directed toward and integrated at the community level. This approach means that people have access to the right service, by the right provider, at the right time and place. The client/family who is at the centre of the model is surrounded by a set of integrated, collaborative processes and procedures that ensure the different care providers work together to meet the client or family needs. The collaboration begins at the community level and then radiates out to regional and territorial level services as required (Figure 21). For example, a patient in Tuktoyaktuk may receive a clinical breast examination in the community, a referral and transfer to Inuvik for a mammogram, and a referral and transfer to Stanton Territorial Hospital for a biopsy (if needed). If further treatment is required, the patient may require a referral and transfer for services out-of-territory. In this situation, the coordination between providers within a service level as well as across different levels will facilitate the mobilization of services as they become required.

Figure 21
Integrated Service Delivery Model for the NWT

Basic Needs
Sustainability
Prevention Oriented System
Universality
People Oriented
Accountability • Transparency
Continuum of Care
Personal Responsibility
Ease and Equitable Access to Services • Competent Care • Information Driven • A Single Sustainable System of Services • Personal Responsibility • Adaptability • Accountability • Transparency • Communications • Patient and Client Focus
Diagnostic and Curative Services
Rehabilitation Services
Protection Services
Continuing Care Services
Promotion and Prevention Services
Mental Health and Addiction Services
PRIMARY COMMUNITY CARE TEAMS
REGIONAL SUPPORT TEAMS
TERRITORIAL SUPPORT TEAMS
CLIENTS/ FAMILY

The Integrated Service Delivery Model (ISDM) has six core business areas: diagnostic and curative services, rehabilitation services, protection services, continuing care services, promotion and prevention services, and mental health and addiction services. Using this model, one can identify how various cancer interventions would fit within each of these core business areas. Table 19 lists the core services with the type of cancer-specific interventions that could be provided. This table only provides examples of how cancer interventions would interact with each core services and does not represent a complete list of interventions.

Table 19
Examples of Cancer Interventions Provided by the Core Services

Core Services	Types of Intervention
Diagnostic and Curative	• diagnostic tests for cancer; cancer treatment (e.g. chemotherapy, radiation, surgery, drug therapy, etc.)
Rehabilitation	• physical or occupational therapy to manage pain and/or symptoms and assist with performing day-to-day functions
Protection	• cancer surveillance • immunization program (e.g. HBV) • environmental testing (e.g. air or water quality)
Continuing Care	• home and community, long-term or palliative care to manage pain and/or symptoms and to improve independence and quality of life for those living with or affected by cancer
Promotion and Prevention	• provide education and awareness about healthy lifestyles (e.g. diet and exercise) and risk behaviours (e.g. smoking and excessive alcohol consumption) • early detection (e.g. cervical or breast screening)
Mental Health and Addiction	• services responding to the social, emotional and psychological concerns of those affected by cancer (e.g. grief, survivorship, anxiety, and stress)

The type of services delivered at the community, regional or territorial level will vary depending on various factors such as the demographics, population health indicators, needs assessments, and cost-effectiveness. If the service is not available at the community level, referrals and transfers are made to regional, territorial or out-of-territory levels. Through collaborative and integrated processes, both horizontally and vertically, all care providers will work to ensure the client/family needs are met.

Population Health Framework

Many factors can influence a person's health status. These include:[54]

- level of income, education and social status;
- support networks among families, friends and the community;
- physical environment, including the home, workplace and community;
- personal health practices, lifestyle choices and coping skills;
- health services;
- healthy child development;
- gender;
- cultural identity; and
- physical characteristics or traits inherited from our parents.

Cancer rates correlate with socio-economic status, but not in a consistent fashion. Low socio-economic status correlates with increased risk of lung cancer, cervical cancer, stomach cancer, and cancer of the head and neck. High socio-economic status increases the risk of breast, prostate and colon cancers. These correlations are probably in large measure due to corresponding variations in risk factors, which have a major social component – e.g. smoking (lung and head and neck), alcohol consumption (head and neck), sexually transmitted diseases (cervix), late age of first pregnancy (breast), and sedentary lifestyle (colon). Furthermore, economic, social and cultural factors can create barriers to accessing information and preventive services.[65]

A population health approach considers a range of individual and collective factors and conditions that are shown to determine, influence or be correlated with health status.[66] The focus of intervention is on the health status of the entire population, or a sub-population. Interventions targeted at specific individuals are clearly still important. However, the population health approach is much broader since it considers the systemic and societal factors that impact populations. Focusing at the population level considers the integration of root causes and contributing factors, and suggests that responses occur through intersectoral action that emphasizes broad public policy, coordination and change.

Improving health ultimately requires moving out of the health sector altogether toward a social policy approach. Interventions, such as efforts to change government policies, organizational practices and provider behaviours, can affect the entire population and its social norms and macroeconomic structure. In addition to a finely tuned public health policy, a healthy public policy will produce the most impact on health.[67] A healthy public policy is a commitment by government to consider every policy in terms of its impact on the well-being of people. By working with other departments, policies in housing, education, economics, employment, and the environment can enhance the overall health status of NWT. In doing so, it is hoped that many diseases such as cancer can either be prevented or delayed.

Moving Forward

Cancer in the Northwest Territories (1990-2000) is a report that explores both cancer incidence and mortality in terms of gender, cancer sites, ethnic groups, and community types. In addition to comparing overall NWT cancer rates to Canada, the cancer sites for the most prevalent diagnoses and deaths were examined as well as the sites in which the age-adjusted rates were higher or lower than those of the Canadian population. This type of examination is best referred to as cancer surveillance (i.e. the ongoing collection, analysis and dissemination of information).

Such descriptive analyses assist in identifying groups at high risk for cancer. However, data from the NWT Cancer Registry can only provide a descriptive profile of cancer in the NWT. Because the registry does not capture other personal information, such as the risk factors and health behaviours of individuals, it is therefore not suitable for reaching conclusions regarding causality. Even if more detailed personal information was available, a person with cancer is often exposed to multiple risk factors, making it difficult to uncover the "true" cause(s). Furthermore, cancer or symptoms of cancer do not often show up until years after exposure. This increases the complexity for identifying the cause or else attributing the cancer to a suspected source.

The detection of high-risk populations can eventually lead to the implementation of programs for modifying behaviour, for improving the physical or social environment, or enhancing access to health services. The type of cancer that is prevalent can suggest probable root causes in the population and thus assist with planning prevention interventions.

So what is known about cancer in the NWT? First, there is an increasing trend in male incidence and female mortality, which are both explainable primarily by the increasing age in the population. Second, the incidence and mortality rate in NWT males are similar to that of females, in contrast to the national data where rates in males are consistently higher. In fact, the NWT male incidence rate is lower than that of national males and the NWT female mortality rate is higher than that of national females. These findings will warrant further research and analysis that goes beyond the scope of this current report. However, the following observations may be made:

1) Dene and Non-Aboriginal/Métis men appear to have a significantly lower incidence of prostate than Canadian males. It is possible that genetics or certain lifestyle behaviours decrease the risk for prostate cancer in this situation. However, it is also possible that prostate cancer screening is not as routinely performed as the other provinces and so the detection of prostate cancer is low. Evidence appears to lean more towards the latter explanation. If the risk for developing prostate cancer were low, one would also expect low mortality. However, this is not the case. In fact, the mortality for

prostate cancer in NWT men is similar to Canadians. Screening for prostate cancer is not routinely performed in the NWT due to its questionable effectiveness.

The NWT Cancer Registry does not currently capture stage of disease at diagnosis. Without this information, it is difficult to resolve whether the low prostate cancer incidence in men and the high cancer mortality in women are related to inadequate screening and thus late diagnosis. The Registry will, however, begin collecting this data in the near future and this should prove useful for upcoming analyses.

2) Although the overall incidence rates are similar in both sexes, women have higher rates than men in specific age groups (i.e. 40 to 49 and 50 to 59 years). This is most likely explained by the average age at diagnosis for breast cancer, which is 53 years, whereas prostate cancer is 67 years. The age group at diagnosis for the two remaining prevalent cancers (i.e. lung and colorectal cancer) is similar for both genders (i.e. 60 to 69 years).

3) When examining site-specific cancer rates in the NWT and comparing them to Canada, the risk for colorectal and stomach cancer in NWT men is higher, yet the risk for prostate cancer is lower than Canadian men. Meanwhile, the risk for colorectal, lung, pancreatic, oral, and liver/gallbladder is higher in NWT women in comparison to national women. Without person-level information, one cannot attribute these higher or lower rates of cancer to a specific cause. Having said that, the risk factors for these cancer types are most often associated with smoking, poor nutrition and a sedentary lifestyle.

Finally, this report does not fully examine health service utilization with regards to cancer. Limitations with the availability of data on medications, outpatient, and home and community care (which represents a large portion of the treatment received by individuals with cancer) under-estimates the actual burden placed on the system. Improvements in capturing this data are required to provide more accurate analyses.

So where should we be going from here? With the NWT population growing, the life expectancy of individuals improving and the proportion of older people in the population increasing, an action plan is necessary to better control and manage the anticipated increase of cancer in the population. Although this report speaks directly to cancer, some of the interventions outlined in this report are less disease-specific and can also apply to other chronic conditions (e.g. cancer prevention and supportive care interventions). Having said that, certain interventions remain specific to cancer (e.g. early detection and treatment). Introducing preventive strategies that address cancer and/or chronic disease and maintaining an organized and coordinated system for providing early detection,

treatment and supportive care are ways to ensure the efficient use of healthcare dollars. In the absence of a comprehensive, coordinated and integrated framework, the demand for healthcare will increase in the near future.

In addition to the release of this report, actions currently undertaken in the NWT include:

- a cancer communication package for presentation upon request to the communities, regional health authorities and policy makers;
- a review of options for a colorectal cancer screening program in the NWT;
- the development of an organized breast screening program to improve coverage, recall and follow-up of women receiving mammograms;
- the implementation of a tobacco prevention and control strategy, including a tobacco unit within the school health curriculum, the creation of by-laws for restricting smoking in public places, and the training of health professionals for counselling smoking cessation;
- a planning framework for the *NWT Active Living Strategy*; and
- enhancement of home care and palliative care services throughout the NWT, through the *First Nations and Inuit Home and Community Care Initiative*.

This report has highlighted the challenges and opportunities for controlling cancer in this aging population. It is timely to develop a long-term, comprehensive, interdisciplinary and NWT-specific strategy for controlling cancer and/or chronic disease in the population. Taking action now means avoiding future loss in productivity due to premature mortality and an increased cost to the healthcare system and society. Strong partnerships, healthy public policy, and a continuum of programs and services are the basic building blocks for a system that can meet people's needs and respond to change.

Appendix 1 – Glossary

Age distribution
The number of people in a population as a function of their age.

Age-specific incidence or mortality rate
The number of age-specific incidence cases (or deaths) relative to the population size from which the cases (or deaths) were derived. It is usually expressed as a rate, in units per 100,000 persons per year (person-years) for a specified age range.

Age standardization or age-adjustment
The adjustment of cancer incidence or mortality rates to reflect the age distribution of a reference population, thus allowing meaningful comparisons (in this case, with national rates). The age distribution of Canada (from the 1996 population) was used as the standard to facilitate comparisons with NWT, ethnic groups and community types. (Refer to indirect age standardization.)

Benign tumour
Tumour that does not invade nearby tissue or spread to other parts of the body.

Cancer control
Cancer control aims to prevent cancer, cure cancer, and increase survival and quality of life for those who develop cancer, by converting the knowledge gained through research, surveillance and outcome evaluation into strategies and actions.

Cancer incidence
The number of new cancer cases diagnosed in a defined population within a specified period. Incidence differs from cancer prevalence, which indicates the number of people that have cancer at a given point in time.

Cancer mortality
The number of cancer deaths that occurred within a specified period. This includes deaths of patients whose cancer was diagnosed in earlier years, persons with a new diagnosis during the year, and patients for whom a diagnosis of cancer is made only after death.

Cancer prevalence
The proportion of a population that is affected by cancer at a given point in time.

Cancer site
Site of tumour origin.

Cancer surveillance
The collection, review and analysis of data that describes incidence, prevalence, morbidity, and mortality due to cancer. The purpose of cancer surveillance is to control the impact of cancer in the population.

Confidence interval (CI)
Range of values in which a true "value" is expected to fall, 19 out of 20 times (expressed as a percentage; e.g. 95% CI).

Crude cancer incidence or mortality rate

The number of new cancer cases (or deaths) divided by the total population at risk, without considering age or other factors. It is usually express cases per 100,000 persons per year. (Refer to cancer incidence or mortality rate.)

Five-year relative survival rate

The probability of living beyond the first five years after being diagnosed with a primary invasive cancer, relative to that of members of the general population who have the same characteristics, such as age, gender and province of residence, as the cancer patients.

Indirect age standardized incidence or mortality rate

The number of incidence cases of cancer (or cancer deaths) per 100,000 person-years that would have occurred in a given population if the actual age-specific rates observed in the standard population (1996 Canadian population) had prevailed in the given population (i.e. NWT).

In situ cancer

Malignant tumours that are confined to the point of origin and have not spread.

Invasive cancer

The uncontrolled growth of normal cells resulting in the formation of a malignant tumour that invades underlying tissues.

Neoplasm

Abnormal and uncontrolled cell growth that often produces a tumour that may or may not be cancerous. (Refer to benign tumour, in situ cancer or invasive cancer.)

Person-years

A measurement combining person and time, used as a denominator in person-time incidence and mortality rates. It is the sum of years that the persons in the population have been exposed to the condition of interest.

Potential years of life lost (PYLL)

The total years of life lost before age 75 for persons who died between birth and 75 years of age. It shows the burden of premature deaths by different causes and the cost in terms of person-years lost to society.

Risk factor

A factor associated with an increased chance of getting a disease; it may be a cause or simply a risk marker. Factors associated with decreased risk are known as protective factors.

Significance levels

Significance levels show you how likely a finding is due to chance. A p value <0.05 means that the finding has a 5% chance of not being true.

Standardized incidence ratio (SIR) or standardized mortality ratio (SMR)

The ratio of the number of observed events versus the number of expected events when adjusting rates for age. If the number of observed events is equal to the number of expected, the SIR (or SMR) is equal to 1.00. If the SIR (or SMR) is greater than 1.00, then the number of observed events is greater than the number of expected, and an SIR (or SMR) less than 1.00 indicates the opposite. Multiplying the SIR (or SMR) by the Canadian rate will provide the age-adjusted rate for the NWT.

Statistically significant or statistically different

Statistical significance determines whether differences observed between groups are "real" or whether they are due to chance.

Three-year rolling average

Ratio of the number of cancer incidents (deaths) in a three-year period relative to the sum of the population size for each year of the three-year period. By combining three years of data to create one point in the graph, the trend becomes less variable and forms a smoother curve.

Appendix 2 – Site Definitions

Table 20
Site Definitions
Cancer data presented in this report are classified according to the following site groupings, except as otherwise noted.

Site	ICD-9	Site	ICD-9
Oral	140-149	Ovary	183
Esophagus	150	Prostate	185
Stomach	151	Testis	186
Colorectal	153-154, 159.0	Bladder	188
Liver and Gallbladder	155.0, 155.1, 156	Kidney	189
Pancreas	157	Urinary	188-189
Larynx	161	Brain	191
Lung	162	Thyroid	193
Melanoma	172	Multiple Myeloma	203
Female Breast	174	Non-Hodgkin's Lymphoma	200, 202
Cervix	180	Leukemia	204-208
Body of Uterus	179,182	All Cancers	All sites between 140-208

Appendix 3 – Male Incidence Tables

Notes for All Tables

Definitions

Crude rate = actual rate
ASIR (age-standardized incidence rate): adjusts for population age differences between NWT and Canada
SIR (standardized incidence ratio): is the ratio of observed to expected cases when Canadian age-specific incidence rates are applied to NWT population

Statistical Significance

* SIR is significantly low – p value < 0.05
** SIR is significantly high – p value < 0.05
Rates based on 20 or fewer cases are likely to be unstable and imprecise
Cancer sites with five or less cases were suppressed

Sources

NWT Cancer Registry and Health Canada – Cancer Bureau

Table 21
Male All Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	419.1	173.3	155.4	193.2	356.4	319.6	397.3	334	0.85	0.76	0.95	* (p < 0.005)	100.0%
Colorectal	56.6	38.4	30.1	48.2	83.4	65.5	104.7	74	1.47	1.16	1.85	** (p < 0.005)	22.2%
Trachea Bronchus and Lung	77.0	33.7	26.0	43.0	76.2	58.8	97.2	65	0.99	0.76	1.26		19.5%
Prostate	100.7	19.7	14.0	27.1	49.4	35.0	67.8	38	0.49	0.35	0.67	* (p < 0.001)	11.4%
Stomach	12.7	11.4	7.2	17.3	24.6	15.4	37.2	22	1.94	1.22	2.94	** (p < 0.01)	6.6%
Non-Hodgkin's Lymphoma	18.5	9.3	5.5	14.8	15.2	9.0	24.0	18	0.82	0.49	1.30		5.4%
Oral	14.3	7.3	4.0	12.2	13.1	7.2	21.9	14	0.91	0.50	1.53		4.2%
Bladder	22.4	6.2	3.2	10.9	14.2	7.3	24.8	12	0.63	0.33	1.11		3.6%
Kidney	13.2	6.2	3.2	10.9	11.6	6.0	20.3	12	0.88	0.45	1.53		3.6%
Testis	4.8	5.7	2.8	10.2	5.4	2.7	9.6	11	1.13	0.56	2.01		3.3%
Liver and Gallbladder	6.9	5.2	2.5	9.5	10.6	5.1	19.6	10	1.55	0.74	2.85		3.0%
Malignant Melanoma	10.9	5.2	2.5	9.5	7.9	3.8	14.6	10	0.73	0.35	1.34		3.0%
Pancreas	9.8	4.7	2.1	8.9	10.3	4.7	19.5	9	1.05	0.48	2.00		2.7%
Leukemia	12.8	4.2	1.8	8.2	7.1	3.1	14.0	8	0.55	0.24	1.09		2.4%

Table 22
Male Non-Aboriginal/Metis Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	419.1	161.7	140.0	186.6	354.2	306.7	408.8	143	0.85	0.72	0.98	* ($p < 0.025$)	100.0%
Trachea, Bronchus and Lung	77.0	30.2	21.1	41.7	74.3	52.0	102.9	46	0.96	0.67	1.33		16.7%
Colorectal	56.6	26.8	18.2	37.8	62.6	42.8	88.4	32	1.11	0.76	1.56		16.6%
Prostate	100.7	22.6	14.8	32.9	65.7	43.1	95.6	27	0.65	0.43	0.95	* ($p < 0.05$)	14.0%
Non-Hodgkin's Lymphoma	18.5	11.7	6.4	19.1	18.8	10.3	31.5	14	1.01	0.56	1.70		7.3%
Bladder	22.4	9.2	4.6	16.5	23.3	11.6	41.6	11	1.04	0.52	1.86		5.7%
Stomach	12.7	7.5	3.4	14.3	17.4	8.0	33.1	9	1.37	0.63	2.61		4.7%
Oral	14.3	7.5	3.4	14.3	13.5	6.1	25.5	9	0.94	0.43	1.78		4.7%
Malignant Melanoma	10.9	7.5	3.4	14.3	11.0	5.0	20.9	9	1.01	0.46	1.92		4.7%
Leukemia	12.8	5.9	2.4	12.1	10.8	4.4	22.3	7	0.84	0.34	1.74		3.6%
Testis	4.8	5.9	2.4	12.1	5.1	2.0	10.5	7	1.07	0.43	2.19		3.6%
Pancreas	9.6	5.0	1.8	10.9	12.0	4.4	26.1	6	1.23	0.45	2.67		3.1%

Table 23
Male Dene Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	419.1	201.1	165.8	243.5	343.9	283.6	416.5	109	0.82	0.68	0.99	* ($p < 0.05$)	100.0%
Colorectal	56.6	70.1	49.6	96.3	123.8	87.7	170.0	38	2.19	1.55	3.01	** ($p < 0.0001$)	34.9%
Trachea, Bronchus and Lung	77.0	38.7	24.0	59.2	69.5	43.0	106.3	23	0.90	0.56	1.38		19.3%
Stomach	12.7	14.8	6.4	29.1	25.9	11.2	51.1	8	2.05	0.88	4.03		7.3%
Prostate	100.7	14.8	6.4	29.1	26.9	11.6	53.1	8	0.27	0.12	0.53	* ($p = 0.0001$)	7.3%
Kidney	13.2	12.9	5.2	26.6	22.0	8.8	45.3	7	1.66	0.67	3.42		6.4%

Table 24
Male Inuit Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	419.1	167.8	114.8	236.9	394.7	270.0	557.3	32	0.94	0.64	1.33		100.0%
Trachea, Bronchus and Lung	77.0	41.9	19.1	87.6	108.3	46.8	213.4	8	1.41	0.61	2.77		25.0%

Table 25
Male Cancer Incidence (cases per 100,000 person-years)
Yellowknife 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	419.1	145.7	121.3	174.8	397.7	331.3	477.3	120	0.95	0.79	1.14		100.0%
Trachea Bronchus and Lung	77.0	27.9	17.7	41.9	90.5	57.4	135.9	23	1.18	0.75	1.78		19.2%
Colorectal	56.6	23.1	13.9	36.0	69.1	41.6	107.9	19	1.22	0.74	1.91		15.8%
Prostate	100.7	19.4	11.1	31.5	79.0	45.2	128.3	16	0.78	0.45	1.27		13.3%
Non-Hodgkin's Lymphoma	18.5	10.9	5.0	20.7	19.9	9.1	37.8	9	1.08	0.49	2.04		7.5%
Testis	4.8	9.7	4.2	19.1	8.5	3.7	16.8	8	1.79	0.77	3.52		6.7%
Malignant Melanoma	10.9	8.5	3.4	17.5	14.1	5.7	29.0	7	1.29	0.52	2.66		5.8%
Oral	14.3	7.3	2.7	15.9	15.4	5.6	33.5	6	1.07	0.39	2.34		5.0%

Table 26
Male Cancer Incidence (cases per 100,000 person-years)
Regional Centres 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	419.1	178.5	141.8	221.9	313.4	248.8	389.6	81	0.75	0.59	0.93	* (p < 0.01)	100.0%
Colorectal	56.6	35.3	20.2	57.3	64.7	37.0	105.1	16	1.14	0.65	1.86		19.8%
Trachea Bronchus and Lung	77.0	28.7	15.3	49.0	53.2	28.4	91.0	13	0.69	0.37	1.18		16.0%
Prostate	100.7	22.0	10.6	40.5	44.1	21.2	81.0	10	0.44	0.21	0.80	* (p < 0.005)	12.3%
Stomach	12.7	19.8	9.1	37.7	36.6	16.7	69.5	9	2.89	1.32	5.48	** (p < 0.05)	11.1%
Bladder	22.4	15.4	6.2	31.8	29.7	12.0	61.3	7	1.33	0.53	2.73		8.6%

Table 27
Male Cancer Incidence (cases per 100,000 person-years)
Smaller Communities 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	419.1	204.7	172.0	243.5	338.1	284.1	402.2	133	0.81	0.68	0.96	* (p < 0.025)	100.0%
Colorectal	56.6	60.0	42.7	82.1	102.2	72.6	139.7	39	1.81	1.28	2.47	** (p < 0.001)	29.3%
Trachea Bronchus and Lung	77.0	44.6	29.9	64.1	77.7	52.0	111.5	29	1.01	0.68	1.45		21.8%
Prostate	100.7	18.5	9.5	32.3	33.2	17.2	58.0	12	0.33	0.17	0.58	* (p < 0.001)	9.0%
Stomach	12.7	13.9	6.3	26.3	23.4	10.7	44.4	9	1.85	0.84	3.50		6.8%

Appendix 4 – Male Mortality Tables

Notes for All Tables

Definitions

Crude rate = actual rate

ASMR (age-standardized mortality rate) "adjusts" for population age differences between NWT and Canada

SIR (standardized mortality ratio) is the ratio of observed to expected cases when Canadian age-specific incidence rates are applied to NWT population

Statistical Significance

* SMR is significantly low – p value < 0.05

** SMR is significantly high – p value < 0.05

Rates based on 20 or fewer deaths are likely to be unstable and imprecise

Cancer sites with five or less deaths were suppressed

Sources

NWT Vital Statistics, Health Canada - Cancer Bureau

Table 28
Male All Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	215.5	87.6	75.6	101.4	206.4	178.2	238.9	185	0.96	0.83	1.11		100.0%
Trachea, Bronchus and Lung	67.5	32.7	25.4	41.4	80.4	62.6	101.8	69	1.19	0.93	1.51		37.3%
Colorectal	26.7	11.8	7.7	17.5	28.6	18.5	42.3	25	1.07	0.69	1.58		13.5%
Prostate	24.4	7.1	4.0	11.7	20.6	11.5	34.0	15	0.84	0.47	1.39		8.1%
Stomach	8.6	5.7	2.9	9.9	13.4	6.9	23.3	12	1.55	0.80	2.71		6.5%
Pancreas	10.0	5.7	2.9	9.9	13.5	7.0	23.6	12	1.35	0.70	2.36		6.5%
Liver and gallbladder	4.4	3.8	1.6	7.5	8.6	3.7	16.9	8	1.95	0.84	3.85		4.3%
Urinary	11.5	3.3	1.3	6.8	8.0	3.2	16.4	7	0.69	0.28	1.43		3.8%
Non-Hodgkin's Lymphoma	7.9	2.8	1.0	6.2	5.8	2.1	12.5	6	0.73	0.27	1.58		3.2%

Table 29
Male Non-Aboriginal/Metis Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	215.5	65.0	51.9	80.2	173.1	138.3	213.8	86	0.80	0.64	0.99	* (p < 0.05)	100.0%
Trachea, Bronchus and Lung	67.5	24.9	17.2	35.0	69.5	47.8	97.6	33	1.03	0.71	1.45		38.4%
Colorectal	26.7	7.6	3.6	13.9	20.9	10.0	38.4	10	0.78	0.38	1.44		11.6%
Prostate	24.4	6.8	3.1	12.9	27.0	12.3	51.3	9	1.11	0.51	2.10		10.5%
Pancreas	10.0	4.5	1.7	9.9	12.1	4.4	26.4	6	1.21	0.44	2.63		7.0%

Table 30
Male Dene Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NW 95% Confidence Limits		NWT Deaths	NWT SMR	NW 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	215.5	125.5	98.4	157.7	219.0	171.7	275.3	73	1.02	0.80	1.28		100.0%
Trachea, Bronchus and Lung	67.5	44.7	29.2	65.5	81.5	53.2	119.4	26	1.21	0.79	1.77		35.6%
Colorectal	26.7	22.3	11.9	38.2	39.2	20.9	67.1	13	1.47	0.78	2.51		17.8%
Stomach	8.6	12.0	4.8	24.8	21.2	8.5	43.6	7	2.46	0.99	5.06		9.6%

Table 31
Male Inuit Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	215.5	126.4	82.6	185.2	335.8	219.3	491.9	26	1.56	1.02	2.28	** ($p < 0.05$)	100.0%
Trachea, Bronchus and Lung	67.5	48.6	23.3	89.4	133.2	63.9	244.9	10	1.97	0.95	3.63		38.5%

Table 32
Male Cancer Mortality (deaths per 100,000 person-years)
Yellowknife 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	215.5	53.4	39.7	70.8	185.6	136.8	246.1	48	0.86	0.63	1.14		100.0%
Trachea, Bronchus and Lung	67.5	22.2	13.6	34.3	82.7	50.5	127.7	20	1.23	0.75	1.89		41.7%
Prostate	24.4	6.7	2.4	14.5	41.7	15.1	90.8	6	1.71	0.63	3.72		12.5%

Table 33
Male Cancer Mortality (deaths per 100,000 person-years)
Regional Centres 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	215.5	90.0	65.6	120.4	187.9	137.0	251.4	45	0.87	0.64	1.17		100.0%
Trachea, Bronchus and Lung	67.5	24.0	12.4	41.9	50.2	26.0	87.7	12	0.74	0.38	1.30		26.7%
Colorectal	26.7	12.0	4.4	26.1	25.8	9.5	56.1	6	0.97	0.35	2.10		13.3%

Table 34
Male Cancer Mortality (deaths per 100,000 person-years)
Smaller Communities 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	215.5	129.1	104.0	158.2	223.5	180.2	274.0	92	1.04	0.84	1.27		100.0%
Trachea Bronchus and Lung	67.5	51.9	36.5	71.5	92.6	65.2	127.5	37	1.37	0.97	1.89		40.2%
Colorectal	26.7	19.6	10.7	33.0	34.4	18.8	57.8	14	1.29	0.71	2.16		15.2%
Prostate	24.4	8.4	3.1	18.3	15.1	5.5	32.8	6	0.62	0.23	1.34		6.5%
Pancreas	10.0	8.4	3.1	18.3	14.8	5.4	32.1	6	1.47	0.54	3.20		6.5%
Liver and gallbladder	4.4	8.4	3.1	18.3	14.4	5.3	31.3	6	3.28	1.21	7.15	**(p<0.05)	6.5%

Appendix 5 – Female Incidence Tables

Notes for All Tables

Definitions

Crude rate = actual rate
ASIR (age standardized incidence rate) 'adjusts' for population age differences between NWT and Canada
SIR (standardized incidence ratio) is the ratio of observed to expected cases when Canadian age-specific incidence rates are applied to NWT population

Statistical Significance

* SIR is significantly low - p value < 0.05
** SIR is significantly high - p value < 0.05
Rates based on 20 or fewer cases are likely to be unstable and imprecise
Cancer sites with five or less cases were suppressed

Sources

NWT Cancer Registry and Health Canada - Cancer Bureau

Table 35
Female All Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	381.6	193.6	173.8	215.5	400.4	359.5	445.8	342	1.05	0.94	1.17		100.0%
Breast	110.7	54.3	44.0	66.3	102.7	83.2	125.4	96	0.93	0.75	1.13		28.1%
Colorectal	48.9	30.0	22.5	39.2	82.8	62.0	108.3	53	1.69	1.27	2.21	** (p < 0.001)	15.5%
Trachea, Bronchus and Lung	47.7	27.7	20.5	36.7	68.7	50.9	90.9	49	1.44	1.07	1.91	** (p < 0.05)	14.3%
Pancreas	10.1	8.5	4.8	14.0	24.7	13.8	40.7	15	2.45	1.37	4.04	** (p < 0.005)	4.4%
Ovary	13.8	8.5	4.8	14.0	16.7	9.4	27.6	15	1.21	0.68	2.00		4.4%
Malignant Melanoma	10.3	7.4	3.9	12.6	10.8	5.8	18.5	13	1.05	0.56	1.79		3.8%
Cervix	9.7	7.4	3.9	12.6	9.5	5.1	16.2	13	0.97	0.52	1.66		3.8%
Oral	5.9	7.4	3.9	12.6	15.4	8.2	26.3	13	2.60	1.38	4.44	** (p < 0.005)	3.8%
Kidney	8.6	6.8	3.5	11.9	14.4	7.5	25.2	12	1.68	0.87	2.94		3.5%
Liver and Gallbladder	5.3	6.2	3.1	11.1	17.7	8.8	31.7	11	3.33	1.66	5.95	** (p < 0.005)	3.2%
Uterus	20.1	3.4	1.2	7.4	7.6	2.8	16.5	6	0.38	0.14	0.82	* (p < 0.01)	1.8%

Table 36
Female Non-Aboriginal/Metis Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	381.6	193.1	167.8	222.0	408.6	355.2	469.8	204	1.07	0.93	1.23		100.0%
Breast	116.7	60.6	46.6	77.3	112.0	86.2	143.0	64	1.01	0.78	1.29		31.4%
Trachea, Bronchus and Lung	47.3	24.6	16.1	36.0	66.0	43.1	96.6	26	1.38	0.90	2.03		12.7%
Colon/Rectum	38.9	21.8	13.6	32.7	67.6	42.8	101.4	23	1.38	0.88	2.07		11.3%
Ovary	11.8	11.4	5.9	19.8	22.5	11.6	39.3	12	1.63	0.85	2.86		5.9%
Pancreas	10.1	9.5	4.5	17.4	32.0	15.4	58.9	10	3.18	1.53	5.84	** (p < 0.005)	4.9%
Malignant Melanoma	10.1	9.5	4.5	17.4	13.1	6.3	24.1	10	1.27	0.61	2.34		4.9%
Oral	5.9	8.5	3.9	16.2	18.3	8.4	34.8	9	3.10	1.42	5.88	** (p < 0.01)	4.4%
Uterus	7.1	6.6	2.1	13.6	7.8	3.1	16.0	7	0.80	0.32	1.64		3.4%

Table 37
Female Dene Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	381.6	195.5	159.6	238.1	370.5	302.5	451.2	102	0.97	0.79	1.18		100.0%
Breast	116.7	46.0	29.5	68.5	86.3	55.3	128.4	24	0.78	0.50	1.16		23.5%
Colon/Rectum	38.9	42.2	26.4	63.8	91.7	57.5	138.9	22	1.88	1.18	2.84	** (p < 0.01)	21.6%
Trachea, Bronchus and Lung	47.3	30.7	17.5	49.8	63.3	36.2	102.8	16	1.33	0.76	2.16		15.7%
Liver and Gallbladder	6.8	11.5	4.2	25.0	24.9	9.1	54.1	6	4.67	1.71	10.16	** (p < 0.005)	5.9%

Table 38
Female Inuit Cancer Incidence (cases per 100,000 person-years)
NWT 1992-2000

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif Low ** Signif. High	
All Cancer	381.6	185.3	129.7	256.4	415.5	290.9	575.1	36	1.09	0.76	1.53		100.0%
Breast	116.7	41.2	17.8	81.1	86.4	37.3	170.2	8	0.78	0.34	1.54		22.2%
Colon/Rectum	38.9	41.2	17.8	81.1	120.4	52.0	237.3	8	2.46	1.06	4.85	** (p < 0.05)	22.2%
Trachea, Bronchus and Lung	47.3	36.0	14.5	74.2	95.0	38.2	195.7	7	1.99	0.80	4.11		19.4%

Table 39
Female Cancer Incidence (cases per 100,000 person-years)
Yellowknife 1992-2000

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	381.6	152.4	126.6	183.3	354.1	294.2	426.0	117	0.93	0.77	1.12		100.0%
Breast	110.7	48.2	33.9	66.4	96.4	67.9	132.8	31	0.87	0.61	1.20		31.6%
Colorectal	48.9	18.2	10.0	30.6	66.0	36.1	110.7	14	1.35	0.74	2.26		12.0%
Trachea, Bronchus and Lung	47.7	16.9	9.0	29.0	52.4	27.9	89.6	13	1.10	0.59	1.88		11.1%
Malignant Melanoma	10.3	11.7	5.4	22.2	17.1	7.8	32.4	9	1.65	0.76	3.14		7.7%
Pancreas	10.1	10.4	4.5	20.5	41.8	18.1	82.4	8	4.15	1.79	8.18	** (p = 0.000)	6.8%

Table 40
Female Cancer Incidence (cases per 100,000 person-years)
Regional Centres 1992-2000

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	381.6	286.5	238.6	343.8	540.8	450.5	648.9	120	1.42	1.18	1.70	** (p = 0.001)	100.0%
Breast	110.7	85.9	60.2	118.9	147.3	103.1	203.9	36	1.33	0.93	1.84		30.0%
Colorectal	48.9	43.0	25.5	67.9	106.4	63.1	168.1	18	2.18	1.29	3.44	** (p = 0.005)	15.0%
Trachea, Bronchus and Lung	47.7	28.6	14.8	50.0	61.9	32.0	108.1	12	1.30	0.67	2.27		10.0%
Oral	5.9	21.5	9.8	40.8	41.1	18.8	78.1	9	6.95	3.18	13.20	** (p = 0.001)	7.5%
Ovary	13.8	14.3	5.3	31.2	25.7	9.4	55.9	6	1.86	0.68	4.06		5.0%

Table 41
Female Cancer Incidence (cases per 100,000 person-years)
Smaller Communities 1992-2000

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASIR	NWT 95% Confidence Limits		NWT Cases	NWT SIR	NWT 95% Confidence Limits		Flag	NWT Proportion of All Cases
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	381.6	186.4	153.2	226.5	346.7	284.9	421.2	105	0.91	0.75	1.10		100.0%
Trachea, Bronchus and Lung	47.7	42.6	27.3	63.4	87.3	56.0	130.0	24	1.83	1.17	2.73	** (p = 0.01)	22.9%
Breast	110.7	40.8	25.9	61.3	74.0	46.9	111.0	23	0.67	0.42	1.00		21.9%
Colorectal	48.9	37.3	23.1	57.0	80.8	50.0	123.6	21	1.65	1.02	2.53	** (p = 0.03)	20.0%
Kidney	8.6	12.4	5.0	25.6	23.1	9.3	47.6	7	2.70	1.09	5.57	** (p = 0.03)	6.7%

Appendix 6 – Female Mortality Tables

Notes for All Tables

Definitions

Crude rate = actual rate

ASMR (age-standardized mortality rate) adjusts for population age differences between NWT and Canada

SMR (standardized mortality ratio) is the ratio of observed to expected deaths when Canadian age-specific mortality rates are applied to NWT population

Statistical Significance

* SMR is significantly low - p value < 0.05

** SMR is significantly high - p value < 0.05

Rates based on 20 or fewer cases are likely to be unstable and imprecise

Cancer sites with five or less cases were suppressed

Sources

NWT Vital Statistics, Health Canada - Cancer Bureau

Table 42
Female All Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	184.1	80.6	68.6	94.6	218.8	186.3	256.9	155	1.19	1.01	1.40	** (p < 0.05)	100.0%
Trachea, Bronchus and Lung	38.7	20.8	14.9	28.3	56.4	40.3	76.8	40	1.46	1.04	1.99	** (p < 0.05)	25.8%
Colorectal	24.4	14.0	9.3	20.4	44.2	29.2	64.4	27	1.81	1.20	2.64	** (p < 0.01)	17.4%
Breast	33.9	10.4	6.4	16.1	24.9	15.2	38.4	20	0.73	0.45	1.13		12.9%
Pancreas	10.1	8.3	4.8	13.5	27.2	15.6	44.2	16	2.69	1.54	4.37	** (p < 0.001)	10.3%
Liver and Gallbladder	3.7	4.2	1.8	8.2	13.3	5.8	26.2	8	3.58	1.54	7.04	** (p < 0.005)	5.2%
Stomach	5.4	3.6	1.5	7.5	10.8	4.3	22.2	7	1.99	0.80	4.10		4.5%

Table 43
Female Non-Aboriginal/Métis Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	184.1	66.9	52.9	83.5	204.8	162.0	255.5	78	1.11	0.88	1.39		100.0%
Trachea, Bronchus and Lung	38.7	18.0	11.1	27.5	54.5	33.7	83.3	21	1.41	0.87	2.15		26.9%
Breast	33.9	10.3	5.3	18.0	26.1	13.5	45.7	12	0.77	0.40	1.35		15.4%
Colorectal	24.4	9.4	4.7	16.9	36.1	18.0	64.7	11	1.48	0.74	2.65		14.1%
Pancreas	10.1	7.7	3.5	14.6	31.0	14.2	58.8	9	3.06	1.40	5.81	** (p < 0.01)	11.5%

Table 44

Female Dene Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	95% Confidence Limits		NWT Deaths	NWT SMR	95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancers	194.1	99.0	74.1	128.9	206.7	156.7	269.2	36	1.12	0.85	1.46		100.0%
Colorectal	24.4	19.8	9.4	36.4	42.9	21.4	76.8	11	1.76	0.88	3.15		20.8%
Trachea, Bronchus and Lung	38.1	19.8	9.6	36.4	42.3	21.1	75.7	11	1.09	0.54	1.96		20.8%
Breast	26.4	12.6	3.1	35.4	25.5	10.2	52.5	3	0.75	0.20	1.95		12.9%

Table 45

Female Inuit Cancer Mortality (deaths per 100,000 person-years)
NWT 1990-1999

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	95% Confidence Limits		NWT Deaths	NWT SMR	95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancers	194.1	106.0	46.5	160.5	311.4	140.3	431.5	22	1.69	1.06	2.56	— (p = 0.05)	100.0%
Trachea, Bronchus and Lung	38.1	38.5	13.6	72.9	109.6	42.7	213.9	8	2.83	1.22	5.58	** (p = 0.00)	36.4%

Table 46

Female Cancer Mortality (deaths per 100,000 person-years)
Yellowknife 1990-1999

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	95% Confidence Limits		NWT Deaths	NWT SMR	95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancers	194.1	54.1	39.4	72.4	190.3	138.1	254.9	41	1.03	0.75	1.38		100.0%
Trachea, Bronchus and Lung	38.1	14.4	7.0	25.7	51.1	25.4	89.7	12	1.32	0.68	2.31		36.7%
Colorectal	24.4	10.8	4.8	20.5	48.8	23.3	92.4	11	2.00	1.00	3.58		33.6%
Breast	26.4	8.4	1.4	27.4	23.8	6.6	69.3	3	0.70	0.18	2.05		10.4%
Prostate	39.1	8.4	1.3	31.9	41.1	10.3	98.4	3	4.06	1.03	8.85	** (p = 0.00)	10.4%

Table 47
Female Cancer Mortality (deaths per 100,000 person-years)
Regional Centres 1990-1999

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	184.1	108.8	80.7	143.3	268.0	198.6	354.2	50	1.46	1.08	1.92	** (p < 0.01)	100.0%
Colorectal	24.4	21.8	10.4	40.0	63.3	30.4	116.4	10	2.60	1.25	4.77	** (p < 0.05)	20.0%
Trachea, Bronchus and Lung	38.7	21.8	10.4	40.0	51.5	24.7	94.8	10	1.33	0.64	2.45		20.0%
Breast	33.9	10.9	3.5	25.4	23.7	11.1	55.2	5	0.70	0.23	1.63		10.0%

Table 48
Female Cancer Mortality (deaths per 100,000 person-years)
Smaller Communities 1990-1999

Site	NWT Canada Crude Rate	NWT Crude Rate	NWT 95% Confidence Limits		NWT ASMR	NWT 95% Confidence Limits		NWT Deaths	NWT SMR	NWT 95% Confidence Limits		Flag	NWT Proportion of Cancer Deaths
			Lower	Upper		Lower	Upper			Lower	Upper	* Signif. Low ** Signif. High	
All Cancer	184.1	97.6	74.4	125.6	211.3	161.2	271.9	60	1.15	0.88	1.48		100.0%
Trachea, Bronchus and Lung	38.7	29.3	17.4	46.2	63.0	37.4	99.6	18	1.63	0.97	2.57		30.0%
Colorectal	24.4	13.0	5.6	25.6	30.6	13.2	60.2	8	1.25	0.54	2.47		13.3%
Breast	33.9	13.0	5.6	25.6	26.7	11.6	52.7	8	0.79	0.34	1.56		13.3%

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